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THE UNIVERSITY OF ALBERTA

A FOLLOW-UP STUDY OF GAS TECHNOLOGY GRADUATES FROM 1965 THROUGH 1971

by

J. ROBERT RAMER

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
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EDMONTON, ALBERTA

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "A Follow-Up Study of Gas Technology Graduates from 1965 through 1971" submitted by J. Robert Ramer in partial fulfilment of the requirements for the degree of Master of Education.

James M. Small
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Date Sept. 27, 1974

ABSTRACT

The purposes of this study were to provide a description of all those who graduated from the Gas Technology program at the Northern Alberta Institute of Technology (NAIT) from 1965 through 1971, touching upon personal data, their reasons for entering the program, their perceptions of the program, their subsequent employment experiences, and their evaluation of the contribution made by the Gas Technology program in preparing them for their present employment.

Data for the study were gathered by means of a mail-out questionnaire sent to all graduates.

Findings of the study indicated that: (1) In general, beginning students in the program have inextensive work experience, most entering within the first year after leaving school, while the decision to enter the program was subject to a variety of factors. (2) Employer sponsored training was the most common upgrading graduates had experienced while the most popular plan for future training involved upgrading of their steam engineering qualifications. (3) Canada Manpower was the most influential agency in helping graduates find their first job, and most graduates were still working at these same jobs at the time of the survey. (4) A small percentage of graduates had received promotions to positions supervising others. (5) The three work areas occupied by the largest number of graduates were engineering technology, gas plant operations, and field operations. (6) Most graduates were

satisfied with their jobs and intended to stay in them. (7) Membership in professional associations and unions was low. (8) Courses taken at a post-secondary institution were considered the best way of maintaining a high level of competence. (9) When compared to other employees of equal experience but lacking their training, graduates thought they were better prepared for their first job, had obtained better jobs, required less on-the-job training, and had better promotional records. (10) Gas plant operations was considered the best employment area for graduates. (11) The NAIT curriculum was rated highly for its usefulness in preparing graduates for work in the gas industry. (12) The five subjects judged most useful for job success were English, Mathematics, Chemistry, Instrumentation, and Gas Processing. (13) The development of an ability for self-education and adaptability was the preferred curriculum emphasis for a majority of graduates. (14) The large majority of graduates would recommend the Gas Technology program to a potential student.

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This study could not have been completed without the help and understanding of many people.

Particularly important was Dr. J. M. Small, my advisor, who showed patience and good humor in providing the insights, suggestions, and criticisms necessary for its completion. Special thanks are also due Dr. R. C. Bryce and Professor A. K. Deane for their contributions on the examining committee.

Mr. H. E. R. Ottley deserves special recognition for his role in suggesting the combined study and in providing guidance in the planning and design phases.

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Chapter 1

INTRODUCTION TO THE STUDY

Post-secondary vocational-technical education is a branch of education which is relatively new and which has grown rapidly during the last two decades as a result of the attention, financing and recognition it has received. Unlike classical and professional education, with their roots in the historical foundations of Western civilization, technical education has been fully included as part of the post-secondary curriculum only since the turn of the century, though the debate about its legitimacy and position continues (Harris, 1964:263-265; Monroe, 1972:72).

The major forces pushing for the inclusion of occupational training in the post-secondary programs of states and provinces were those emanating from the rapidly developing industrial revolution. In its early stages the technological changes which brought about the obsolescence of worker's skills occurred rather slowly, and society was able to cope with them with relative ease; but as time passed the quickening pace of technological change made such adaptation increasingly difficult (Rosenberg, 1966:4), and led to the development of educational programs designed to prepare people for the new occupations created.

Canadian response to the developing demands of technology for new skills was often much less than required. Porter (1965:93-94) argued that historically Canada had relied "heavily on skilled and professional immigration to upgrade its labor force in periods of industrial growth." The thrust of Porter's argument was that Canada should develop its own educational system so as to provide training for its people if it wished to realize its potential for industrial growth and provide the opportunities for mobility which are its people's birthright.

An increased political awareness of the lack of opportunity for Canadians to develop their technical skills revealed by such studies as Porter's, and an increased recognition of the fact that the flow of skilled immigrants from European countries was abating due to the rapid growth of European industry, resulted in the Federal Government of Canada passing in 1961 of the Technical Vocational Training Assistance Act, which provided up to ninety percent of the costs incurred by provinces if they would build vocational and technical schools. Responding to this federal initiative, Alberta rapidly expanded its post-secondary vocational-technical educational facilities during the years from 1961 to 1967 (Bryce, 1970:4).

This rapid development of facilities and programs was not matched by an equivalent amount of research and many problems have resulted which require investigation. One of the pressing problems is the evaluation of the educational programs that were developed during the rapid growth of the technical institutes. To cope with inevitable obsolescence of programs as requirements change such evaluation should be of an ongoing nature thus ensuring up-to-date data for the decision makers involved with such programs. This suggests that the research undertaken should be of a type which would provide for the regular gathering of information from former students. One of the best techniques available for this type of evaluation is the follow-up study (Monroe, 1972:57).

The basic purpose of the follow-up study is to provide a communication link between the institution and its graduates so that they are provided with an opportunity to express their opinions about the strengths and weaknesses of their educational experiences relative to their post-graduation experiences. The information obtained may then be used by the institution to evaluate the effectiveness of its programs. Follow-up studies have the added advantage of providing the institution with up-to-date data on the career mobility of the graduates, their level of responsibility, and other factors that could be included in descriptive or statistical studies.

Besides obtaining the graduates' assessment of the value of their educational experiences, it is also important for the institution to know how the employers view the training of the graduates as judged by their preparedness for employment in their fields. This information could be acquired through suitably designed follow-up studies, and used in conjunction with the views of the graduates in appraising the relevance and value of the educational programs.

O'Conner (1965:9-10) suggests such information may have a number of uses. For students the studies would provide reliable "information regarding the success of former students... entering employment; justify subject requirements for graduation;

and give incentive for developing traits and competence in ways shown to be requisite for future success." In addition, follow-up studies provide instructors with information about the relevance of the courses they teach; provide counselors with a factual base for advising students regarding career choices and success expectations; provide the institution with facts on which to base admission policies, modify programs, establish performance standards; and provide information about new materials that should be included in a program to keep it up to date.

LOCUS AND BACKGROUND OF THE STUDY

The research involved in this study grew out of a desire to explore various aspects of follow-up studies of the type described above. Because of its accessibility to the researchers the Northern Alberta Institute of Technology was chosen as the locus of the study.

The Northern Alberta Institute of Technology (NAIT) is one of two Institutes of Technology in the province of Alberta offering post-secondary instruction in the business, occupational and technological fields. Operations started in 1963 and at the present time (1972) enrollment on any given day is about 4,400.

Administratively NAIT is divided into four divisions — Business and Vocational Education, Continuing Education, Industrial, and Technology — each of which is headed by a director. Each division is sub-divided into departments, and each department is further sub-divided into sections. The Gas Technology section is one of nine sections in the Engineering Sciences Department, which in turn is one of the five departments in the Technology Division.

Gas Technology is a two-year program, which provides training for employment in the Natural Gas and related industries. One-hundred and seven students graduated from this program in the years from 1965 through 1971, with 1965 being the first year students were graduated from the program. The beginning enrolment for both years of the course for 1971-72 was seventy-nine.

Individual sections at NAIT have shown interest in, and conducted follow-up studies as a means of determining necessary modifications to the curriculum. Despite the potential advantages, there has been no overall co-ordination of these efforts, nor has there been any concerted attempt to encourage other sections to undertake similiar studies.

Interest in this study originated from a desire on the part of the researchers to see more widespread use of follow-up studies as an evaluative technique at NAIT. The decision to use the Gas Technology graduates was made for the following reasons:

1. The Section Head and the Department Head have shown an interest in using follow-up studies as a basis for curriculum revision. With their support, the study could serve as a pilot project for further studies of a similiar nature.

2. The program offers no options or specialization streams. All graduates were thus assumed to have similiar backgrounds, except for variations resulting from course revisions.

3. The employment experiences of the graduates were assumed to have a basic similiarity. Most of them were employed by companies whose main concern was the production, processing, and marketing of natural gas, or by companies engaged in business related to the natural gas industry.

4. The program was designed to meet a specific need in an oil-producing province, and is unique in that it is the only one of its type in Canada.

PURPOSES OF THE STUDY

The purposes of this study were to provide a description of all those who graduated from the Gas Technology program from 1965 through 1971, touching upon personal data, their reasons for entering the program, their perceptions of the program, their subsequent employment experiences, and their evaluation of the contribution made by the Gas Technology program in preparing them for their present employment. The main purpose of the companion study (Ottley, 1973) was to obtain a similiar assessment of the value of the Gas Technology program from the supervisors of the graduates and to compare these assessments with those of the graduates.

In keeping with the purposes of this study answers were sought to the following questions:

1. What were the characteristics of students entering the program?

2. Who was most influential in their decision to enrol in

the Gas Technology program?

3. Did the graduates perceive training for immediate employment as being more valuable than training in basic principles?

4. What were the graduates' perceptions of their preparedness for employment?

5. What curriculum subjects were judged most relevant to success on the job?

6. How relevant was the training for the jobs the graduates were required to perform?

7. What were the graduates' overall assessments of their program?

8. How did graduates obtain their first job placement upon graduation?

9. How did the graduates' promotional records compare with other employees having similiar jobs and equal experience, but lacking equivalent formal training?

10. What patterns of advancement and remuneration were experienced by graduates?

11. What area of the natural gas industry provided the best employment opportunities for graduates?

12. To what extent did graduates affiliate with trade and professional organizations?

13. What did graduates perceive as the best way to keep up-to-date with their technology?

14. What post-graduation educational activities were the

graduates involved in?

15. What were the attitudes of graduates toward their existing employment?

16. What were the graduates' plans for their career futures?

17. What were the strengths and weaknesses of the methodology used in this study?

SIGNIFICANCE OF THE STUDY

The joint study was designed to provide useful information for technical institutes as well as providing pertinent data to those concerned with the decisions related to the Gas Technology program.

Its significance to technical institutes lay in its unique design and pilot project characteristics. First, a team (Ottley, Ramer) worked on the overall design of the combined study and in gathering the data. A team of instructors interested in gathering information from former students and [illegible] employers should be able to profit from the experiences gleaned in the combined study.

Second, a novel feature of this joint study was the use of mail-out questionnaires to solicit the opinions of both graduates and their supervisors with identical or parallel questions to each group. It was thus possible to make direct comparisons of the views of the graduates and their supervisors in order to reveal any differences in perceptions held by these two groups about the quality of training received by the graduates and their subsequent employment records. Any significant deviations would have implications for the choice of respondents in future follow-up studies.

Third, this study provided a description of the views of graduates of the Gas Technology program. This information should be useful to those concerned about modifying and improving the Gas Technology program, as well as providing an example of a type of research which might be used in other programs and by other educational institutions.

In broader terms, the combined study could show the use of follow-up as an avenue of feedback which is potentially beneficial to the educational institution, the graduate, and the industries employing the graduates. The institution is provided with an opportunity to gauge its success in terms of their graduates' achievements in their chosen careers. At the same time it can assess the relevance of the programs offered to the needs of industry. The graduates are assured of the institution's continuing interest in them, and are provided with an opportunity to contribute to program improvement and the updating of training for future graduates. Industry may benefit from the chance to establish liaison with the institution and the opportunity to criticize and recommend improvements to the program. Hopefully, this would result in better trained personnel for their employment needs.

The joint study was also significant in that it ventured into an area of research for which there were few specific guidelines and little precedent. The major achievements anticipated in this respect were the observations of the problems encountered, and the corresponding actions which might be taken in the conduct of follow-up studies.

SPECIFICATIONS

In this part of the chapter the delimitations, limitations, and definitions of terms for the combined study are provided.

Delimitations

The joint study included all graduates of the Gas Technology Section at NAIT, from the inception of the program in 1963 up to and including the graduates of 1971, and all known supervisors of these graduates, provided that the supervisors were employed with companies engaged in the petroleum, natural gas, or related industries.

Limitations

1. Mobility, unknown addresses and other reasons resulted in an inability to reach all intended respondents.

2. The respondents' interpretations of the wording of the questionnaire may not reflect the intentions of the researchers.

3. The researchers' interpretations of the responses to open-ended questions may not reflect the intent of the respondents.

4. Conclusions and implications resulting from the study are based on information gathered at one particular moment in time, and are thus not necessarily indicative of the past or the future.

5. Opinions expressed by supervisors are personal and do not necessarily reflect the policy of the company with whom they are employed.

Definition of Terms

The following definitions are intended to clarify some of the terms used in this study.

Advisory Committee. A group of representatives from the petroleum and natural gas industries which provides advice and guidance on matters pertaining to the Gas Technology curriculum, student placement, and industry trends. Feedback from the students' viewpoint is provided by including in the membership two graduates of the program.

Gas Technology. The term Gas Technology is used to designate the program of studies at NAIT which provides training for employment in the natural gas and related industries.

Gas Technology Section. This term is used to refer to the administrative unit at NAIT under whose jurisdiction the Gas Technology program is administered.

Graduate. The term graduate is used to denote any individual who has received a diploma in Gas Technology from NAIT.

Section Head. The term Section Head refers to the person in charge of the Gas Technology Section.

Immediate Supervisor. The term immediate supervisor is used to refer to any individual who is a representative of a company employing Gas Technology graduates and who was identified by either the company or by a graduate as being the person to whom graduates reported.

Second-Line Supervisor. The term second-line supervisor is used to refer to any individual who is a representative of a company employing Gas Technology graduates and who was identified by that company as being in a supervisory capacity two or more levels removed from the graduate.

ORGANIZATION OF THE THESIS

Two researchers, Horace E. R. Ottley and this author, collaborated in conducting the joint study under the guidance of Dr. J. M. Small and Dr. R. C. Bryce. The combined study was envisaged as a single project and was organized so that the research design, development of the research instruments, collection of data, and some aspects of the data analyses were carried out jointly by both researchers. Regulations of the Faculty of Graduate Studies and Research at the University of Alberta prevented joint publication of theses, so each of the researchers prepared a separate thesis document, and conducted data analyses applicable to the specific areas of concern into which the combined study was later divided.

In keeping with the requirements for separate theses the document prepared by Ottley (1973) focused on the second major purpose of the joint study, which was to obtain an assessment of the contribution made by the Gas Technology program in preparing graduates for their present employment from both graduates and their supervisors and to make a comparison of these assessments.

The research reported in this thesis focuses on the first major purpose of the joint study which was to provide a description of all those who graduated from the Gas Technology program from 1965 through 1971, which included personal data, their reasons for entering the program, their perceptions of the program, their subsequent employment experiences, and their evaluations of the contribution made by the Gas Technology program in preparing them for their present employment.

The organization of the remainder of this thesis is as follows:

Chapter 2 provides a review of literature revealing the need for follow-up studies of vocational-technical students, as well as the literature dealing with the design and use of mail-out questionnaires.

Chapter 3 presents a brief discussion of follow-up studies that had been done at NAIT as some of that material had been helpful in the design of this combined study.

Chapter 4 describes the research design of the joint study and discusses how it was developed.

Chapter 5 provides the description and analyses of the data derived from the completed questionnaires returned by the graduates.

Chapter 6 contains a discussion of some of the issues raised by the findings of the study.

Chapter 7 provides a summary of the study, as well as conclusions, recommendations, and suggestions for further research.

The bibliography is followed by appendices divided as follows: Appendix A contains the initial and reminder letters to employing companies, Appendix B contains the questionnaires, covering letters, reminder card, and card of thanks, and Appendix C contains the objectives of the Gas Technology Section.

Chapter 2

RELATED LITERATURE

The literature reviewed for this study is limited to three areas: the importance, value, and need for follow-up studies; follow-up studies of vocational-technical graduates; and literature dealing with the problems associated with the mail-out questionnaire as a research technique.

Importance, Value and Need for Follow-up Studies

There are scattered references to the need for follow-up research on vocational-technical students. Roueche and Boggs (1968:51) in their study of junior college institutional research concluded:

> Junior colleges claim to be multipurpose comprehensive institutions, yet typical research study focuses on only one segment of the institution's students — those who transfer to four year institutions... There is little available research on junior college drop-outs or on those who graduate from technical or vocational programs.

In a study on the use of follow-up studies in the evaluation of vocational education, Sharp and Krasnegor (1966:15-16) also found that:

> We know practically nothing about the students or graduates of post-secondary or supplementary vocational education. A major gap in this area is lack of knowledge of the junior college student enrolled in occupational training.

They go on to emphasize that the follow-up study is a "useful tool" in evaluating training and in providing needed data on the employment outcomes and experiences.

Bodnarchuk (1968:30) stresses the need for follow-up studies which he sees as being essential in evaluating and improving the effectiveness of the curriculum, in encouraging better teaching, and in improving the value and usefulness of guidance services.

Goff (1968:155-159, 204) studied follow-up procedures aimed at graduates of technical institutes in the United States. He found that only one in fifty state directors of education conducted follow-up studies at the state level, and 12 percent of the directors reported that no systematic follow-up was done at the local level. Of one-hundred and thirty-four local administrators who conducted follow-up studies, Goff found that 30.5 percent gathered information from the student prior to his leaving the school, 52.3 percent used mailing addresses from permanent records, 35.9 percent conducted the study six months or more after graduation, and 85.7 percent attempted to contact all of the graduates. One of the conclusions he reached was that information reported to the United States Office of Education "was inaccurate and incomplete due to ineffective follow-up methods." A follow-up procedure which he recommended was: (1) orient the students to the purposes and uses of follow-up studies before they graduate; (2) use a student exit questionnaire; and (3) mail a ten-item post card type questionnaire to the student about four months after graduation.

Deem, Jr. (1969:52, 158-160) found a failure to use follow-up studies for the evaluation and improvement of courses among a significant number of the institutions he studied in his research on the organization, personnel, and procedures used in conducting follow-up studies in public junior colleges in the United States. His research led him to conclude that the primary purposes for conducting follow-up studies should be to evaluate and improve the institution's performance of stated objectives, its curriculum, its courses and their content, its counseling and guidance services, and its instruction. He also concluded that the most pressing need was for follow-up studies of vocational-technical students.

Gordon (1969:i,ii) reported on a longitudinal study done by the General College of the University of Minnesota in which a stratified random sample of three-hundred 1958 freshmen, with below average high school records, were contacted for the purpose of obtaining their vocational, family, and educational experiences, in addition to securing their evaluation of the impact of their General College education experiences on their lives. He concluded that the study revealed:

> ...the desirability of consultation with students — and former students — through continuing dialogues, and the necessity of concurrent effort on the part of higher education to maintain its pertinence to the needs of the students it serves.

The Wisconsin Board of Vocational, Technical, and Adult Education (1970:iv) developed guidelines for conducting follow-up studies in order to provide the Wisconsin Vocational, Technical, and Adult Education districts with guidelines for conducting follow-up studies, so the educational system would have available a standardized and reliable method of gathering the information needed to evaluate and improve its curriculums as required by technological change. The study provided a brief theoretical rationale for follow-up studies, and detailed instruments for studies conducted at six months, two and one-half years, five and one-half years, and ten and one-half years after graduation, as well as providing instruments for special optional and drop-out follow-up studies.

In a study of the community college systems of seven states, Morsch (1971) found that most states were doing little in the way of follow-up studies. Florida (60) was an exception to this in that it was initiating an extensive research program, based on surveys and interviews of program graduates. Their entire program was heavily oriented toward follow-up of former program enrollees, which Morsch sees as support of the contention that follow-up is the only realistic evaluation technique that is available.

Follow-up Studies of Vocational-Technical Graduates

Matteson (1966:148-156) obtained information about the employment experiences of the 1961 male graduates of three San Francisco East Bay junior colleges, over a three year period, and related these experiences to their training. His response rate was 75 percent he found that while 81 percent were classified as transfer students, only 51 percent actually transferred. Matteson compared those who took jobs after graduation by dividing them into two sub-groups; those who had taken the transfer programs and those who had taken the terminal programs. He found that terminal students tended to know the kinds of jobs they would take after graduation, that most found jobs related to their training, that they were more likely to credit the college for their occupational success, that they started on jobs at approximately the same level of difficulty, that they had higher average starting salaries, but that the duties assigned to them on the job were somewhat less responsible. At the end of three years the difference in assigned level of responsibility remained though the pay differential had disappeared. The transfer students indicated they would not have chosen the terminal program had their been no transfer program offered, whereas the terminal students would have taken the transfer program had the terminal program not been offered.

Stephenson (1967) conducted a follow-up study of the 1963 through 1966 graduates of the Dental Assisting Program of the Contra Costa College in San Pablo, California, and the dentists who employed them in order to determine the effectiveness of the training program. Graduates and dentists were in agreement that the training program should place more emphasis on customer processing skills, bookkeeping, and billing. They differed in their perceptions of the importance of the development of x-ray skills, with the graduates ranking this higher than the dentists. Recommendations were made for the use of the research findings as a basis for curriculum re-evaluation.

Dennison and Jones (1969) conducted a follow-up study by mailing questionnaires to the two-hundred and seventy-eight former students (from twelve career programs) of Vancouver City College one year after their scheduled 1968 graduation date, and to fifty-one persons who were listed as employers on returned student questionnaires. They received ninety-nine (36 percent) usable responses, with sixty-nine (70 percent) coming from graduates, and thirty (30 percent) from those who did not graduate. Considerable difficulty in locating former students was experienced and they reported the use of the Directory Assistance of the local phone company as the most effective method, as the addresses from the college records were found to be unreliable. It was suggested that the Canadian Social Insurance number might be an effective means of tracing graduates. Recommendations resulting from the study included: an expanded public relations program to acquaint employers with the aims and objectives of career programs, a modified open-door policy, and exploration of ways in "which career students might be permitted to transfer to the university or technical institutes." They also concluded that employers rated the college trained graduates higher than those without training.

Collin (1971:iii-iv,15) conducted a follow-up study of all graduates of all regular, daytime technical-vocational programs at the Alberta Agricultural and Vocational Colleges for the period 1966 to 1970, inclusive. Of the 1243 questionnaires mailed out, 66 percent were completed and returned. He found that: (1) job preparation was the major reason students attended the Colleges, (2) a majority of the students got involved in the Colleges' social, cultural, and recreational activities, (3) nearly 80 percent received jobs immediately after graduation; 65 percent of them reported that jobs were related to programs taken, (4) about 50 percent of those graduating from agricultural programs returned to the farm, (5) the majority thought the programs and facilities of the college were very good to excellent, and (6) over 80 percent rated highly their overall experiences at the college. Thus Collin concluded that from the perspective of the graduates, "the Alberta Agricultural and Vocational Colleges are meeting their objectives and the needs of the students to a very high degree" and that few changes are desired.

Factors Affecting Design

As a first step in carrying out follow-up research consideration must be given to various methods of gathering data. The most common method is the mail-out questionnaire, which has both advantages and disadvantages.

Franzen and Lazarsfeld (1945:293-4) suggest the following advantages for the mail-questionnaire:

First, it is a relatively inexpensive way of gathering data. A mail contact can be made at small cost no matter where the person being contacted lives.

Second, there are at least three respects in which the mailed questionnaire holds the possibility of being superior to the personal interview from the point of view of research technique. (a) If its questions aim at situations, or decisions which concern the entire household, opportunity for consultation within the family occurs. (b) The interviewer is often unable to contact a desired person because of distance, or busy schedules. Such people can often be reached by mail. (c) The impersonality of a questionnaire as compared with an interview may prompt different shadings of responses which may be more accurate.

Implicit to the discussion of the mail questionnaire is the recognition that this data gathering method is only one of several tools available for doing survey research, and that it should be used only when careful planning of the overall research design shows it to be the preferred method. This close relationship between research design and research tool was emphasized by Oppenheim (1966:2):

> The subject of questionnaire design is intimately related to the general plan or design of the survey. A questionnaire ...is essentially a scientific instrument for measurement and collection of particular kinds of data. Like all such instruments, it has to be specially designed according to particular specifications and with specific aims in mind, and the data it yields are subject to error. We cannot judge a questionnaire as good or bad, efficient or inefficient, unless we know what job it was meant to do. This means that we have to think not merely about the wording of particular questions, but, first and foremost, about the design of the investigation as a whole.

Problem areas referred to in the literature are: (1) the problem of validity; (2) the difficulties involved in obtaining representative returns to the questionnaire; and (3) the possible differences between respondents and non-respondents.

Validity. The central question involved in assessing the validity of a questionnaire is the question of whether or not people can be trusted to express their views without willful distortion. Walsh (1967:18) deals with the question of validity in two articles discussing two experiments he conducted. In his examination of the literature he found there were seven studies concerned with the validity of questionnaire data. Three of the studies gave an impression of high validity, while the remaining four reports suggested that the validity of questionnaire data is low. In an attempt to clear up the conflicting findings cited, Walsh ran an experiment of his own. To tidy up his first experiment he ran a second experiment a year later (1968). In his experiments Walsh was concerned with all forms of self-reporting, including questionnaire. He concluded that the questionnaire responses were valid, and that no one method of eliciting self-reports (questionnaire, interview, personal data-bank method) is superior to others in validity.

The fact that validity studies have reached different conclusions suggests that caution needs to be exercised in the interpretation of data gathered by any form of self-reporting.

Rate of return. Care must also be taken in ensuring that the questionnaire replies are representative of the population being studied. Two sources of bias can be identified. First, if sampling is used, the sample may not be representative, and second, even if the sample selected is representative of the population being studied, the respondents to the questionnaire may not be representative of the sample. Toops(1950:946) stresses these problems when he writes:

> Many questionnaire investigations are defective in that the available mailing list is a biased sample of the population for which findings are desired, and, when the percent of blanks returned does not approach 100 percent, the sample of a sample obviously can be even more biased.

It has been amply demonstrated that the rate of return on a questionnaire sent out on a "one-shot" basis, is generally too low to provide useful data. Norman (1948:236) in reviewing first wave and single questionnaire responses cited in the literature found returns ranging from 15 to 76 percent with the majority being from 15 to 40 percent. This has led researchers using the questionnaire to recognize the necessity of a carefully planned, systematic follow-up program to ensure higher response rates than can be expected when no follow-up is used.

Toops (1950:949) suggests that to approach a 100 percent return six to ten follow-ups will be needed. In another part of the same article he suggests that with five to eight follow-ups, each appealing to somewhat different motives, "the researcher never need settle for less than a 95 percent return."

Different approaches to follow-ups have been used by different researchers. In an early study by Toops, as cited in Norman (1948:236), Toops used six follow-up letters to achieve a 100 percent response (1923). Reid (1942:87-88) was successful in raising an initial response of 42 percent to 69 percent by using three waves of questionnaires. Others, such as Sletto (1940) have used postcards as follow-ups and claimed success. Probably a combination of letters, postcards, and questionnaires is the best in a follow-up campaign.

Rosen and Rosen (1955:178-81) dealt with the nonrespondent problem by picking a sample of the nonrespondents and interviewing them to get the information sought on the original questionnaire. The data thus gathered were used to correct for bias that might have existed in their original "sample of a sample".

A second factor affecting rate of return is the type of reward offered to the potential respondent for his cooperation. Hancock (1940) experimented with four methods in seeking responses to a questionnaire on attitudes toward retail stores. He mailed out four sets of questionnaires divided as follows: the first set had no reward for filling in and returning the questionnaire; the second set of questionnaires each included 25 cents to be kept by the recipient; the third set included a promise of 25 cents if the questionnaire was filled in and returned; and the fourth was filled in by an interviewer. The percentage of returns for each method was, respectively, 10 percent, 47 percent, 18 percent, and 86 percent. The second method was judged best in terms of unit costs with the results being sufficiently accurate. Shuttleworth (1931) found the enclosure of 25 cents with a simple questionnaire resulted in a return rate of 51.6 percent while the same questionnaire sent out without the coin yielded a return of only 19.1 percent.

A third factor affecting rate of return is the form of the questionnaire. Nixon (1954:481-487) stresses the importance of consideration of the respondent to help achieve the objective of getting as many responses as possible. He writes:

> If questionnaire forms meet the criteria of physical attractiveness and obvious consideration for respondent, it is believed that the percentage of replies will be sufficiently high to fulfill the requirements of the investigator. Every conceivable inducement should be used in the hope of convincing one more potential respondent to take the time and effort necessary to answer the questionnaire.

A fourth factor affecting the rate of return is the potential respondents knowledge of the researcher. Personal knowledge of the sender of the questionnaire is thought to increase the rate of response. Best (1970:172) suggests that the sponsorship of a person or organization known to the responder, particularly if the person or organization is prestigeful, also increases the rate of response.

A fifth factor which needs to be considered is the time of year that the questionnaire is sent out. If a questionnaire is being sent to accounting firms that handle income tax returns, income tax time would be a poor time to send them a questionnaire. Norman (1948:238) cites a National Education Association study which indicates a 75 percent return can be expected if a questionnaire is issued to teachers in September, October, November, or December, whereas only 64 percent can be expected in the months from January through May. These findings apply to schools and are open to considerable interpretation as to cause.

Two other factors that may have some influence on rate of response are the length of the questionnaire and whether signatures are required on the questionnaire. Mouly (1963:256) cites length of the questionnaire as being one of the important determiners of response. "Generally, the shorter the questionnaire, and the less demand it makes on the respondent's time, the higher the percentage of returns."

Fischer (1946:225) found contradictory statements in the literature about the effect of signatures on the data gathered as well as rate of response. It does appear, however, that questionnaires which ask about highly personal things will be answered less readily if the respondent thinks the researcher can identify him by name.

Respondents versus nonrespondents. There is some evidence to support the widely held presumption in survey research that those who respond to a survey instrument differ from nonrespondents on variables such as aptitude and level of education.

Suchman and McCandlers (1940:769) found two variables that affected the response rate in their study of radio-listening behaviour. They were interest or familiarity with the topic under investigation, and the general educational level of the respondent. The more familiar and better educated were more likely to respond.

Orr and Neyman (1965:378) found a direct relationship between the level of aptitude and the likelihood of response; the higher the aptitude, the greater the chance of response.

Cope (1968:35) found that "nonrespondents do not appear in any significant way to differ from respondents on personality dimensions". This supports the earlier findings of Bennet and Hill (1964:180) who stated: "Within the limitations of the study, our results imply that users of mailed questionnaires need not be as concerned about possible personality bias due to nonresponse as implied in the literature."

In summary, then, respondents seem to differ from nonrespondents in intelligence and educational achievement but there does not seem to be any proven personality factors related to respondents that are significantly different from those associated with nonrespondents.

Because of the general bias that may be introduced by such differences as intelligence and level of education, Bennet and Hill (1964:178) prescribe levels of return that should be aimed for:

> There is general agreement among statisticians and research workers that sample bias resulting from nonresponse is a common and serious problem in mailed questionnaire studies. This alleged sample bias is attributed to differences between respondent and nonrespondent groups. A 60 percent response to a mailed questionnaire study is considered to be good, but not sufficient to eliminate the main effects of this bias. An 80 percent response is considered to be necessary for the nonrespondent group to be sufficiently heterogenous and small to eliminate the main effects of nonresponse bias.

Evaluative criteria. Mouly (1963:262) suggests nine evaluative criteria that can be used as a check on the quality of a questionnaire both during construction and after completion. Best (1970:170) lists eight characteristics of a good questionnaire. Both imply that the quality of the questionnaire is an important determiner of the recipients response, including both care of response and likelihood of response. The following list of criteria is a combination of the lists presented by Mouly and Best:

1. The topic being researched must be significant and the

significance communicated clearly to the respondent.

2. It must clearly seek information not available elsewhere.

3. It is kept as brief as the problem will allow so as to not make undue demands on the responders time.

4. The directions to the respondent are clear, complete, and acceptable.

5. Each of the questions deals with a single idea.

6. Important terms are defined.

7. It is attractive in appearance, neatly arranged, and clearly duplicated or printed.

8. The questions are objective and free from ambiguity and other invalidating features. Leading questions are avoided.

9. Questions are presented in good psychological order, going from the general to the more specific responses.

10. Questions that may embarrass the respondent or place him on the defensive are avoided.

11. The questions are so arranged that they can be readily tabulated and interpreted.

Summary

In this review of the literature the need for follow-up studies was identified. Such studies provide information about the effectiveness of the curriculum, the acceptability of the teaching methodologies used, and the perceived value of the guidance and placement services provided.

A review of the existing follow-up studies of vocational-technical graduates revealed the scarcity of such research.

The literature dealing with the factors affecting the design of follow-up studies was also reviewed, with special attention being paid to the problems associated with the mail-out questionnaire as a follow-up technique. Many of the ideas gathered from this review were incorporated into the design of the follow-up study reported in chapter 4.

Chapter 3

FOLLOW-UP STUDIES AT NAIT

The review of the literature revealed a paucity of follow-up studies of vocational-technical graduates. In order to obtain additional information useful in the development of a methodology for follow-up of graduates of occupationally oriented programs, inquiries were made about previous follow-up studies that had been done at NAIT and at the Southern Alberta Institute of Technology (SAIT). Though no studies were located at SAIT, inquiries at NAIT resulted in the identification of eight different follow-up surveys, all involving the mailing of questionnaires to graduates or former students of the six preceding years.

Six of the eight surveys were carried out in the Engineering Sciences Department, while the other two were done in the Electronics Department and the Business Administration Department.

The studies conducted in the Engineering Sciences Department can be broken down into three groupings. The first was a study done at the Departmental level involving four sections consisting of Architectural, Civil, Drafting, and Surveying, and are reported on here as a single study as a common questionnaire was used. The studies involving the Materials and Gas Technology Sections' graduates were done at the sectional level and are reported on separately.

Two other studies were identified. The first was done at the sectional level in the Electronics Department, the second was conducted on a Departmental basis in the Business Administration Department.

Survey of Architectural, Civil, Drafting, and Surveying Technologies

One study conducted a common survey in the Architectural, Civil, Drafting, and Surveying Technologies. Questionnaires were mailed to graduates and nongraduates of the years from 1965 through 1970, providing they had taken two years of the program. Of 470 questionnaires mailed, a total of 53 (11.3 percent) were returned. One of the reasons for the poor return rate may have been that no attempt was made to increase the rate through the use of either reminder letters or telephone calls.

The survey was conducted to provide a description of the employment records, salaries earned, levels of responsibility attained, and the amount of additional education taken, together with information from the former students about their assessment of the value of the courses they had taken while at NAIT.

The Engineering Sciences Department Head saw the mail-out questionnaire as an easy way to solicit the opinions of large numbers of people but was of the opinion that interviews would have been more successful in eliciting constructive criticism useful in curriculum revisions. This view reflected his dissatisfaction with the lack of information about the curriculum gathered by the questionnaire.

Survey of Materials Technology

The Materials Technology survey was conducted to provide information useful in reviewing and updating the curriculum. Questionnaires mailed to both graduates and employers, received a 65 percent return. The high rate of response was attributed to sectional loyalty rather than any particular procedure being followed to increase the rate of return.

The Section Head expressed the opinion that the information gathered in the survey had been useful for the subsequent review of the curriculum. Employers' responses were described as specific and ample.

Questionnaires sent to the graduates had two omissions, in the opinion of the Section Head. The first involved salary levels attained by graduates; the second involved ascertaining the levels of responsibility assigned to graduates by the employers, both at the beginning of their work careers and after a few years experience.

Survey of Gas Technology

A follow-up study of the graduates of the Gas Technology program was conducted by mail-out questionnaires being sent to all graduates from 1965 through 1970 in an attempt to obtain information from graduates useful in updating the curriculum. Procedures used to increase the percentage return rate included telephone calls to employers and graduates as well as a letter soliciting their cooperation sent a short time after the original questionnaire with covering letter had been mailed. This led to a final return rate of 69 percent.

Most parts of the questionnaire used were designed with open-ended questions. This resulted in problems in tabulating and reporting of responses. The questionnaire also lacked questions designed to obtain a clear assessment of the graduates' views of how well the program had equipped them for their jobs. In the Section Head's opinion the questionnaire could have been improved by using a more closed type of question as well as by improving the specificity of questions eliciting evaluations of the jobs obtained as well as the quality of preparation for those jobs.

Electronics Technology Survey

This survey was a department wide study in which questionnaires were mailed to all students who had attended two years of the program. Response rates varied from a low of 65 percent to a high of 80 percent, depending on the year involved. This relatively high rate of response was achieved by sending out reminder letters.

Difficulties were experienced both in collecting the data and in the analyses of results. In the collecting of the data the major problem was that of locating the correct addresses of the former students. Though the data were gathered for curriculum review purposes, it turned out that there were insufficient man-hours available for detailed analyses of the results. Attempts to use the computer at NAIT to speed up analyses were unsuccessful as the computer was not available at that time. Some analyses were done resulting in a projects lab being built for the communications program, a suggestion made by many of the former students.

Business Administration Survey

This study differed from the others in that an attempt was made to mail questionnaires to all students that had enrolled in the programs during the six years from 1965 to 1970, inclusive. The study was never judged to be very successful by those involved in conducting it. Problems were experienced in obtaining student addresses; problems were also experienced in the interpretations of the results, due in part to what was described as a "poorly constructed questionnaire." No attempts were made to increase the 30 percent response rate, and while some tabulation of results was done, the information gathered was never used for curriculum revision, though that had been the intended purpose of the study.

Summary

The studies done at NAIT varied considerably in their success in obtaining high return rates, with return rates varying from 11.3 percent to a high of 80 percent. The lowest return rate was on the survey done at the departmental level of the Architectural, Civil, Drafting, and Survey technology graduates and non-graduates. The Electronics Department, by comparison, was able to obtain return rates of from 65 to 80 percent by having the individual sections send out reminder letters. The third departmental study was a survey of all former students of the Business Administration Department during the years from 1965 through 1970, with a response rate of 30 percent being achieved. Of the three departmental studies, the results of the survey done in the Electronics Department were the only ones used for their intended purposes.

Two surveys were initiated at the sectional level. The Materials Technology survey of it graduates and their employers achieved a response rate of 65 percent, and produced information later used for curriculum change. The Gas Technology survey of its graduates achieved a response rate of 69 percent and was also the source of information subsequently used for curriculum revision.

Chapter 4

RESEARCH DESIGN AND PROCEDURES

In this chapter a description is given of the research design used and the methodology followed. In addition, the steps followed in developing the questionnaire and gathering and analyzing the data are explained.

RESEARCH DESIGN

The joint study was designed as a follow-up study and fits Sharp and Krasnegor's (1966:1) definition that such "studies involve research designs which require a contact with individuals who have shared an experience in the past and whom the researcher desires to study or restudy". The design used was classified as a "One-Time Descriptive Study" and shares with such studies the one major weakness of placing "reliance on information obtained at one particular moment in time from which to draw conclusions for past and future," (p.8) thus requiring caution in drawing conclusions from the findings.

In keeping with the recommendations found in the "Guidelines for Survey Research and Questionnaire Construction" (1970) of the Florida Community Junior College Inter-Institutional Research Council, the first step taken was to attempt to define clearly the purposes of the survey, which were to provide analyses of the responses of employers and graduates on questions relevant to the Gas Technology program, and to provide more data on the methodology of follow-up research.

RESEARCH PROCEDURES

The research procedures used in identifying the populations, developing the questionnaires, and collecting and analyzing the data are described in this part of the joint study.

Identification of the Population

Two populations were used in the study: the first consisted of all 107 graduates of the Gas Technology Program at NAIT up to and including 1971; the second consisted of all those persons identified by a company representative as working in a supervisory capacity relative to a graduate. Where no direction was available from the employing company, those identified by graduates were contacted. The supervisor population was further divided into immediate and second-line supervisors based solely on the advice of company representatives.

A decision was made to identify the graduates' supervisors by first contacting representatives of employing companies and asking them to name the supervisors. Graduates were asked to name their supervisor on the questionnaire sent to them, and supervisors thus named were checked against the names provided by the company representatives. Names were added to the supervisor population if different. Approaching the companies first had the advantage of providing an opportunity to collect updated addresses for graduates employed by the companies, as well as allowing supervisors to be identified.

The first step in locating the names of companies was to check with Canada Manpower at NAIT. In this way a list of seventeen companies who had sought Gas Technology graduates was obtained.

Telephone calls were then made to eleven of these companies having offices in Edmonton. The representatives contacted were told the purposes of the study and were asked to provide the names and addresses of graduates employed by their company, and the names and addresses of the supervisors of those graduates. No requests were rejected, though two asked that the requests be made in writing, and four representatives asked that the requests be made to their head office in Calgary. Of the two representatives who asked that the requests be made in writing, one provided the information requested without delay, but it took several telephone calls and a four week delay before a response was received from the second company.

Next, the researchers obtained permission from the Academic Vice-President of NAIT to attend the Gas Technology Advisory Committee's Annual Meeting which was held about one week after the initial telephone calls were made. When asked for support of the study after being given an explanation of its purpose, the study received the unanimous approval of the committee, and eight of those present gave suggestions on how information on graduates and their supervisors could best be obtained from their companies. Six of the eight promised to provide the information themselves, which resulted in the addition of six more companies to the seventeen originally obtained. The members also suggested that a comparison of the views of immediate supervisors with those of second-line supervisors be made. (See Ottley,1973)

Approximately one week after the Advisory Committee Meeting, letters (Appendix A) were sent to either the chief engineer or the personnel officer of fifteen companies, stating the purpose of the study, and requesting the names and addresses of their immediate supervisors, and the names and addresses of supervisors two or three levels above the graduates. The fifteen companies approached included the four whose Edmonton representatives had recommended writing to the head office in Calgary, but not the companies whose representatives on the Advisory Committee had promised to forward the information. Replies were received from all fifteen companies within five weeks providing the names and addresses of thirty-seven first-line and seventeen second-line supervisors, and updated addresses for fifty-two graduates. The response pattern to these letters is shown in Table 1.

The names of additional supervisors were collected by checking the names of supervisors given on graduate questionnaires received against the supervisors contacted. This resulted in eleven immediate supervisors working for seven different companies being added to the supervisor population.

The permanent records at NAIT were used (by permission) for obtaining the names of graduates and their permanent addresses.

Table 1

Replies to Letters Sent to Companies Requesting Names and Addresses of Graduates and Supervisors

Time after mailing	Replies by letter or phone	Comments
First week (March 1-7,1972)	2	1 No graduates 1 Forwarded to another for action
Second week (March 8-15)	2	1 Information received 1 No graduates
Ten reminder telephone calls made		
Third week (March 15-21)	5	4 Information received 1 Unable to supply the information
Two letters sent to companies not contacted by phone		
Fourth week (March 22-28)	2	2 Information received
Fifth week (March 29-April 4)	4	2 Information received 2 No graduates
Totals	15	15

Fifty-two of these addresses were updated from company information, and twenty updated addresses were obtained from the Head of the Gas Technology Section.

Instrumentation

Consideration was given to telephone surveys and interviews as potential ways of carrying out this follow-up study, but the fact that the populations were scattered over a large area together with the problems involved in getting current addresses for the graduates led to the conclusion that these methods would be too costly and time-consuming to be practical, thus resulting in them being ruled out in favor of the mail-out questionnaire.

In order to benefit from the experience and expertness of others who had done follow-up studies at NAIT, interviews were arranged with those who were known to have done such studies. Eight studies were identified (see chapter 3 for details) and the principals interviewed to obtain suggestions growing out of their experience which might help in designing the instrument. Two of the persons interviewed had contacted both graduates and employers, and they suggested the following points be kept in mind when doing such research: (1) make personal contact with the employers, (2) in requesting the companies' cooperation, be sure the person contacted has a high enough position in the company, and (3) be sure the questions used on the questionnaire are concise and straight-forward, dealing with areas in which the respondent is knowledgeable.

An interview was also arranged with a faculty member of the Division of Institutional Research and Planning of the University of Alberta to obtain his views on sampling, the problems associated with follow-up studies, the design and wording of questionnaires, and problems in the use of the computer in analyzing the data gathered. He advised against sampling where the populations were small and also helped set up the system of coding used on the questionnaires (Appendix B). Later the questionnaires were submitted to him and he made useful suggestions related to the wording of some of the questions.

Categories of questions and questionnaire format for the graduate questionnaire were determined by using the information gleaned from these interviews and information gathered from the studies of O'Connor (1965), Sharp and Krasnegor (1966), and Snyder and Blocker (1969). Additional information and examples helpful in creating the supervisor questionnaire were found in Tuttle (1964), Stephenson (1967), and the Wisconsin Board of Vocational, Technical, and Adult Education (1970)guidelines for follow-up studies.

The first drafts of the questionnaire were submitted for pretesting to the following people: (1) The Research Project Director of the Division of Institutional Research and Planning referred to above, (2) a representative of a company engaged in the petroleum industry, (3) five staff members at NAIT, two of whom instruct in the Gas Technology program, and (4) graduate students (colleagues) in the M. Ed. program in Educational

Administration at the University of Alberta. Using the recommendations thus gathered, which involved rewording of some of the questions used to clarify their meaning, the final drafts of the questionnaire were constructed (Appendix B).

The questionnaires sent to the graduates each had a total of twenty-nine questions, while those sent to the supervisors had fourteen questions. Questions four to fourteen in the supervisors' questionnaires were identical to questions nineteen to twenty-nine in the graduates' questionnaires, to allow comparison of responses for those two groups on the value of NAIT Gas Technology training. The questionnaires sent to the graduates were printed on blue paper while the questionnaires sent to the supervisors were printed on pink paper, in an attempt to make them distinctive and attractive.

Collection of Data

The first mailing of questionnaires, together with a letter of explanation and a return envelope, was sent to graduates and supervisors on March 15, 1972, and additional mailings were made on March 20, March 24, and March 29.

Each prospective respondent was given a three digit identification number. In the case of both supervisors and graduates, the first two digits were a numerical listing, with the third digit being used to identify the supervisors as either immediate or second-line, and the graduates according to their year of graduation. The numeral "3" was used to identify immediate supervisors, "4" to identify second-line supervisors, "5" to identify 1965 graduates, "6" to identify 1966 graduates, "0" to identify 1970 graduates, and "1" to identify 1971 graduates. These numbers were entered on the questionnaires before mailing, and were used to identify returned questionnaires to facilitate follow-up.

As the completed questionnaires were received the responses were coded for key punching. Graduate addresses on file at NAIT were updated from the questionnaires, and the names of their supervisors were checked, to see if they had been contacted. Supervisors thus identified, who had not been contacted before, were sent questionnaires.

For purposes of sending out reminder postcards, questionnaires mailed on March 15th and 20th were treated as one group, whereas questionnaires mailed out March 24th and 29th were treated as a second group. Nonrespondents from the first group were sent reminder postcards on April 5, 1972, while nonrespondents from the second group were mailed their reminders April 7th. Some unusable responses were in the form of a letter or telephone call explaining why the person did not complete his questionnaire.

The final date for receipt of questionnaires was May 2, 1972. Of the 107 questionnaires, eighty-two (76.6 percent) usable responses were received, and of the sixty-five questionnaires sent out to the supervisors, fifty-five (85 percent) usable responses were received. Displayed in Table 2 is the breakdown of questionnaire responses.

Table 2

Distribution of Questionnaire Responses

Group	Number sent out	Responses received		Responses used	
		f	%	f	%
Graduates by year of graduation					
1965	14	8	57.1	8	57.1
1966	8	7	87.5	7	87.5
1967	9	7	77.8	7	77.8
1968	10	6	60.0	6	60.0
1969	18	15	83.3	15	83.3
1970	17	14	82.4	14	82.4
1971	31	25	80.5	25	80.5
Totals	107	82	76.6	82	76.6
Supervisors by sub-groups					
Immediate supervisors	48	45	93.8	41	85.4
Second-line supervisors	17	16	94.1	14	82.4
Totals	65	61	93.8	55	84.6

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1968	10	6	60.0	6	60.0
1969	18	15	83.3	15	83.3
1970	17	14	82.4	14	82.4
1971	31	25	80.5	25	80.5
Totals	107	82	76.6	82	76.6
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Immediate supervisors	48	45	93.8	41	85.4
Second-line supervisors	17	16	94.1	14	82.4
Totals	65	61	93.8	55	84.6

Analyses of Data

The questionnaires were coded as they arrived and the data were punched onto data processing cards, which were then used in the computer analyses. Comments submitted were also compiled for incorporation into the analyses and description of results which are presented in chapter 5.

Two statistical programs from the Division of Educational Research Services were used: the first was the NONP10 (statistical program, 1972), which was used to determine the frequency and percentage of responses on each variable; the second was the NONP01 (statistical program, 1969), reported in the Ottley study (1973), and used to determine whether statistically significant differences existed between the responses of the groups studied.

Chapter 5

ANALYSIS OF DATA

The primary purpose of the joint study was to investigate and document the occupational and educational activities of graduates, and their perceptions of their training. A mail questionnaire was designed to obtain information from the graduates (Appendix B); a second questionnaire was also designed to solicit opinions from the supervisors of the graduates (Appendix B).*

In this chapter the results received in response to the graduate questionnaire are described, with the data presented in the same order as they occur in the questionnaire: vital statistics, pre-NAIT experiences and influences, occupational and educational plans and experiences following graduation, and evaluation of the NAIT Gas Technology program.

PERSONAL CHARACTERISTICS

All graduates of the Gas Technology program are males, so only marital status and age are reported.

Marital Status

The marital status of graduates by year of graduation is presented in Table 3. Of the 82 respondents, 58, or 70.7 percent

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*The thesis of H. Ottley (1973) contains a comparison of the views of graduates and their supervisors.

Table 3

Distribution of Graduates by Marital Status and Year of Graduation N = 82

Year of Graduation	Single		Married		
	No.	Percent	No.	Percent	Totals
1965	0	0	8	100	8
1966	1	14.3	6	85.7	7
1967	2	28.6	5	71.4	7
1968	0	0	6	100	6
1969	4	26.7	11	73.3	15
1970	4	28.6	10	71.4	14
1971	13	52.0	12	48.0	25
Total	24	29.3	58	70.7	82

were married. Of the respondents who indicated they were single, 13 of the total 24 came from the 1971 graduating class, which contained 25 of the respondents. The data seems to suggest that many of the graduates get married within the first two years after graduation.

Age

The average age of all respondents for the year of graduation was 21.32 years. The distribution of ages is presented in Table 4; none of the respondents at graduation was younger than 20 years, and only three were older than 24 years. The average age at graduation has fairly consistently dropped from 22.57 years in 1965, to 20.46 years in 1971. Since there has been no change in the duration of the program it appears that Gas Technology students enter the program at an earlier age than in the past.

PRE-NAIT EXPERIENCES

Graduates were asked about their pre-NAIT educational and occupational experiences, and to identify the chief influence in their decision to enrol in the Gas Technology Program at NAIT.

Number of Years Out of School Before Attending NAIT

The largest percentage (52.4 percent) of respondents were out of school less than one year before commencing their program at NAIT; 24.4 percent were out of school more than one year but less than two years, 9.8 percent were out two or more but less than

Table 4

Distribution of Graduates by Age
for Year of Graduation
N = 78

Year of Graduation	Ages of respondents at graduation								Total	Average Age
	20	21	22	23	24	25	26	29		
1965	2	1	2	0	1	0	0	1	7	22.57
1966	0	2	3	2	0	0	0	0	7	22.00
1967	0	3	4	0	0	0	0	0	7	21.57
1968	0	3	2	0	1	0	0	0	6	21.83
1969	2	7	1	3	1	0	0	0	14	21.57
1970	6	3	2	1	0	0	1	0	13	21.23
1971	6	9	4	3	0	1	0	0	24	20.46
Total	16	28	18	9	3	1	1	1	78	21.32

Table 5

Distribution of Graduates According to Number of Years* Out of School Before Enrolling in Program by Year of Graduation
N = 82

Year of graduation	Number of years						Totals
	0	1	2	3	4	5 or more	
1965	3	2	0	0	1	2	8
1966	1	4	2	0	0	0	7
1967	5	2	0	0	0	0	7
1968	3	0	2	0	1	0	6
1969	10	3	1	0	1	0	15
1970	9	3	0	1	0	1	14
1971	12	6	3	1	1	2	25
Total	43	20	8	2	4	5	82
Percent of Total	52.4	24.4	9.8	2.4	4.9	6.1	100.0

* Full years.

three, 7.3 percent were out three or more years but less than five, and 6.1 percent were out five or more years (Table 5). The year by year breakdown displayed does not reveal any patterns that might suggest an explanation for the previously noted (Table 4) decline in average age of respondents at time of graduation.

Pre-NAIT Activities

The distribution of graduates according to the activities engaged in immediately prior to enrolment is shown in Table 6. The majority (55.6 percent) were in school, with 48.1 percent attending high school, and 7.5 percent attending post-secondary institutions. Of the 35.8 percent who were working, 8.6 percent were working in the gas technology area.

Chief Influence in Choice of Program

In considering the major factor in their decision to enrol in the Gas Technology Program, the largest number (43.9 percent) thought no one in particular could be credited with this influence; another 20.7 percent indicated they were influenced by factors other than those provided in the question, 9.8 percent were influenced by employees in the gas technology field, 6.1 percent by their high school counsellors, and 3.7 percent were influenced by their families (Table 7).

Summary

In general, as evidenced in Tables 4-7, beginning students in the Gas Technology Program have inextensive work experience,

Table 6

Distribution of Graduates According to
Their Pre-NAIT Activities by
Year of Graduation
N = 81

Activity	Year of Graduation								Percent by Total
	1965	1966	1967	1968	1969	1970	1971	Total	
Attended Institute of Technology	0	0	0	0	1	0	0	1	1.3
Attended High School	3	2	4	2	9	9	10	39	48.1
Attended Community or Junior College	1	0	0	1	0	0	0	2	2.5
Attended University	0	0	1	0	0	0	2	3	3.7
Worked in Gas Technology Area	1	1	0	0	1	0	4	7	8.6
Worked in Other Fields	2	2	2	2	2	5	7	22	27.2
Other	1	2	0	1	2	0	1	7	8.6
Total	8	7	7	6	15	14	24	81	100.0

Table 7

Distribution of Graduates According to Their
Chief Reason for Enrolling
in Program
N = 82

Chief Influence	Year of Graduation								Percent of Total
	1965	1966	1967	1968	1969	1970	1971	Total	
Family	0	1	1	0	0	1	0	3	3.7
High School Counsellor	0	0	2	0	2	0	1	5	6.1
Students or Graduates of Gas Technology	0	1	1	1	3	2	5	13	15.9
Employees in the Gas Technology Field	1	0	1	1	1	1	3	8	9.8
No one in Particular	2	5	1	1	7	8	12	36	43.8
Other	5	0	1	3	2	2	4	17	20.7
Total	8	7	7	6	15	14	25	82	
Percent by Total	9.8	8.5	8.5	7.3	18.3	17.1	30.5		100.0

most entering within the first year after leaving school, while the decision to enter the program appears to be subject to a variety of factors.

OCCUPATIONAL AND EDUCATIONAL EXPERIENCES AND PLANS FOLLOWING GRADUATION

Analysis of the graduates' responses to questions eliciting information about their educational and occupational experiences and plans since graduation is presented in this section.

Training Taken Since Graduation

Graduates were asked (Questions 6 and 7) to indicate any additional courses or training taken since graduating together with any degrees, diplomas, or certificates either sought or earned. The distribution of responses to these questions is presented in Table 8.

A total of 52.4 percent of the respondents indicated they had taken some employer sponsored training; 19.5 percent had taken courses toward upgrading their steam engineering qualifications; and 21.9 percent had taken courses at either a university or technical institute.

Question 7 elicited responses from 39 graduates. Of these, nine were either working toward university degrees in engineering or had completed such programs. It is interesting to note that eight of these respondents were graduates from the years 1965 through 1968, and represented 28 percent of the respondents for those years.

Table 8

Distribution of Graduates According to Training Taken Since Graduation
N = 82

Type of Course or Training	Number	Percent of Total
Employer Sponsored Training	43	52.4
Apprenticeship Training	2	2.4
Studies Leading to Senior Technologist Status	2	2.4
Studies Leading to Professional Engineering Qualifications	8	9.8
Upgrading Steam Engineering Qualifications	16	19.5
University (fulltime)	6	7.3
University (part time)	6	7.3
Technical Institute (part time)	6	7.3
Other	12	14.6

As might be expected, there were graduates who had taken additional education in unrelated fields. These were engaged in such activities as: working toward a Bachelor of Education degree, working for certification as a Registered Industrial Accountant, working for a commercial radio operator's license, working toward higher certification as a real estate agent, selling life insurance, and managing a business owned by the graduate. The total number who had moved into other fields, however, represented less than 9 percent of all respondents.

In summary, about 80 percent of the respondents indicated they were either seeking, or had obtained additional training. Of those who had taken no additional training, a majority (76.5 percent) were from the 1970 and 1971 graduates. Thus there was evidenced a tendency to postpone professional upgrading for a year or two after graduation.

Plans for Further Training

Graduates were asked to indicate their plans for further education (Question 8, Appendix B) and a distribution of their responses is displayed in Table 9.

The largest number, 36.6 percent indicated plans to upgrade their steam engineering qualifications; 28 percent had plans for employer sponsored training; 17.1 percent were planning to take studies leading to senior technologist status; and 23.2 percent indicated they had no plans for further education.

A count revealed that 63 graduates indicated some plans for

Table 9

Distribution of Graduates According
to Plans for Further Education
N = 82

Type of Course or Training	Number	Percent of Total
Employer Sponsored Training	23	28.0
Upgrading Steam Engineering Qualifications	30	36.6
Apprenticeship Training	1	1.2
Studies Leading to Senior Technologist Status	14	17.1
Studies Leading to Professional Engineering Status	7	8.5
Technical Institute	1	1.2
University	8	9.8
No plans	19	23.2
Other	5	6.1

additional education. Of 19 who indicated no plans, four were graduates who had already completed some additional training, with the amount varying from a fireman's certificate to a Bachelor of Science degree in metallurgical engineering. Thus only 15 (18.3 percent) of the graduates indicated no interest in additional training after graduation.

Factors Most Helpful in Obtaining First Job

Canada Manpower at NAIT was credited as being the most helpful in obtaining their first job after graduation by 53.2 percent of the respondents; 30.4 percent considered direct contact with the employer as having been most important; while 12.6 percent chose either instructor, advertisements, or friends and relatives as having been most important (Table 10).

A year by year breakdown of responses is shown in Table 10. Instructors were chosen as having been most influential by only five (6.3 percent) of the respondents; but three of these five were from the 1965 graduates, representing 42.9 percent of that class. The other two graduates were from 1966 and 1967 classes respectively. Since the 1965 class was the first to graduate, it would appear the instructors were influential in helping students find jobs at that time.

Secondly, Canada Manpower played a much more important role for the 1968 through 1971 classes than for the earlier ones. It was credited as being most important by 20 percent of the respondents from the 1965 through 1967 classes; but was given this credit by

Table 10

Distribution of Graduates According to What Was Most Helpful in Obtaining First Job After Graduation

N = 79

Factor Judged Most Helpful	1965	1966	1967	1968	1969	1970	1971	Total	Percent of Total
Direct Contact with Employer	3	4	3	1	3	3	7	24	30.4
Canada Manpower at NAIT	1	1	2	4	12	8	14	42	53.2
Instructor	3	1	1	0	0	0	0	5	6.3
Advertisements	0	0	0	0	0	0	1	1	1.3
Friends or Relatives	0	0	0	0	0	2	2	4	5.0
Other	0	0	1	1	0	1	0	3	3.8
Total	7	6	7	6	15	14	24	79	100.0%

64.4 percent of the 1968-71 group.

Opportunity was provided for comments from graduates about how they got their first jobs and 53 percent chose to do so. The responses confirm the above trends.

Comments illustrating direct instructor involvement in placement came from graduates of the 1965 through 1967 years. A 1966 graduate's comment represented the view of several when he wrote:

> A combination of Instructor being responsible for oil companies' interviews at NAIT and direct personal contact with those people responsible for hiring plus the great desire of the instructor (Mr. F. Babet) to see grads placed throughout the oil and gas industry made it relatively easy on grads in obtaining jobs.

As the program became established Canada Manpower became increasingly important in helping graduates obtain jobs while the instructors moved from a direct role in graduate placement to a more indirect one. Many of the 1967 through 1971 graduates wrote comments mentioning the importance of the role played by Canada Manpower in obtaining their first job.

Graduates were also asked to indicate if their first job was a continuation of a summer or part-time job, and 25.6 percent indicated that it was.

Number of Full-Time Jobs Held Since Graduation

None of the graduates held more than three jobs since graduation (Table 11). Further, for all years except 1965, over half were still working at the same job they first obtained upon graduation. For 1965, 25 percent were still working at their first

Table 11

Distribution of Graduates According to the Number
of Full Time Jobs Held Since Graduation
N = 80

Year of Graduation	Number of Jobs Held								
	0		1		2		3		
	f	%	f	%	f	%	f	%	Total
1965	0	0.0	2	25.0	3	37.5	3	37.5	8
1966	0	0.0	4	57.1	1	14.3	2	28.6	7
1967	0	0.0	5	71.4	2	28.6	0	0.0	7
1968	0	0.0	4	66.7	2	33.3	0	0.0	6
1969	0	0.0	9	60.0	4	26.7	2	13.3	15
1970	0	0.0	14	100.0	0	0.0	0	0.0	14
1971	2	8.0	18	72.0	5	20.0	0	0.0	25
Totals	2	2.4	56	68.3	17	20.7	7	8.5	82

job.

Number of People Supervised and Number of Promotions

Supervision and promotion data are displayed in Tables 12 and 13. "No responses" were treated as zeros in Table 12 based on the assumption that respondents whose duties included supervision would respond to the supervision question (Question 12d, Appendix B).

A comparison of the two tables reveals marked differences. Only 14.6 percent of the graduates (12) indicated they supervised anyone, and of that 12, five indicated they supervised only one person. By comparison, 77 percent of the graduates indicated they had received one or more promotions (Table 13). The combined data suggests that while most graduates had received some recognition through promotions, few of the promotions were to supervisory positions.

Year by year analysis revealed that while no 1971 graduates had been promoted to supervisory positions, 16 of them had received their first promotion, and of these, four had received their second promotion, and two had received their third promotion. An examination of year by year data suggests that most promotions for graduates occur early in their careers.

Incomes of Graduates

Average incomes were computed by assigning median values* to each of the nine categories used in item 12c of the questionnaire

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*550 or less became 525; 551-600 became 575; 900 or over 925.

Table 12

Distribution of Graduates According to the Number of People Supervised Shown by Year of Graduation
N = 82

Year of Graduation	Number of People Supervised						Total
	0	1	2	3	4	9	
1965	5	0	1	0	1	1	8
1966	6	1	0	0	0	0	7
1967	3	2	1	1	0	0	7
1968	6	0	0	0	0	0	6
1969	14	0	0	1	0	0	15
1970	11	2	0	0	0	1	14
1971	25	0	0	0	0	0	25
Total Responses	70	5	2	2	1	2	82
Percent of Total	85.4	6.1	2.4	2.4	1.2	2.4	100.0

Table 13

Distribution of Graduates According to the Number of Promotions Received Shown by Year of Graduation
N = 78

Year of Graduation	Number of Promotions 0	1	2	3	4	5	Total
1965	2	2	4	0	0	0	8
1966	1	5	0	0	1	0	7
1967	0	1	3	3	0	0	7
1968	1	1	2	1	0	0	5
1969	1	4	3	3	1	2	14
1970	4	2	4	1	2	0	13
1971	9	9	4	2	0	0	24
Total Responses	18	24	20	10	4	2	78
Percent of Total	23.1	30.8	25.6	12.8	5.1	2.6	100.0

(Appendix B). The results of calculations providing averages are shown in Table 14.

An examination of the averages reveals that with two exceptions, the earlier the year of graduation, the higher the average income. The first exception is the 1965 class, with an average income of 787.50 dollars per month, more that 54 dollars less than the average for the 1966 graduates. If, however, the incomes of the two 1965 graduates who were attending university full time are deducted, the average works out to 850 dollars per month. The other exception involves the 1970 and 1971 graduating classes, with the 1971 graduates reporting incomes averaging 2.29 dollars more per month than the 1970 graduates. This difference could be due to possible errors in view of the method used in rounding off incomes.

The number of graduates indicating incomes of over 900 dollars per month also reveals the relationship between year of graduation and income. If the 1965 through 1968 graduates earning over 900 dollars are grouped as early graduates, and the 1969 through 1971 graduates are grouped as late graduates, we find that 31 percent of the early graduates reported incomes over 900 dollars per month, while only 11. 3 percent of the late graduates reported incomes that high. In general, then, it appears that incomes are related to years of work experience.

Percentage of Time Spent in Different Employment Areas

Graduates were asked to indicate the percentage of time

Table 14

Distribution of Graduates According to Year of Graduation and Monthly Rate of Pay
N = 79

Year of Graduation	Monthly Rates of Pay in Dollars									Total Graduates	Total Dollars	Averages
	525	575	625	675	725	775	825	875	925			
1965	1	-	-	2	1	-	-	-	4	8	6,300	$787.50*
1966	-	-	-	-	-	2	2	-	2	6	5,050	$841.67
1967	-	-	-	-	2	1	3	-	1	7	5,625	$803.58
1968	-	-	-	1	1	1	-	1	1	5	3,975	$795.00
1969	1	-	1	3	1	2	1	1	4	14	10,850	$783.93
1970	-	2	3	2	3	1	-	3	-	14	9,950	$710.71
1971	2	2	6	3	3	2	3	2	2	25	17,775	$713.00
Totals	4	4	10	14	11	9	9	7	14	79	59,525	753.48

spent in various areas of work for both the job held at the time of the survey and for their first job after graduation, if it was a different job. A total of 72 graduates responded to the question (Question 13, Appendix B) regarding their job at the time of the survey, while 33 responded to the question (Question 15, Appendix B) about their first job. The data from the two questions are presented in Tables 15 and 16. A comparison of the two tables suggests there is little difference in the distributions of time between the first and present job. The following comments refer specifically to the data from the job held at the time of the survey.

Engineering technology. This work area would include such jobs as planning and designing of facilities, routine calculations, gas plant valuations, and the writing of reports. Of all respondents, 43 percent indicated they spent no time; 16.7 percent spent between 1 and 24 percent; 11.1 percent spent between 25 and 99 percent; 11.1 percent spent between 50 and 74 percent; and 3.1 percent spent between 75 and 100 percent of their time working in this area.

Gas plant operation. Gas plant operation is made up of such jobs as plant operation, plant maintenance, plant start-up, and the regular reporting of information about the operation. Of all respondents, 57 percent reported working in this area; with 19.5 percent spending all their time, 16.7 percent spending between 50 and 99 percent of their time, and 20.8 percent spending less than 50 percent of their time working in this area.

Table 15

Distribution of Graduates According to Time Spent in Different Employment Areas in Job Held at Time of Survey

N = 72

Area of Work	Percentage of time spent in each area						Totals
	0.0%	1-24%	25-49%	50-74%	75-99%	100.0%	
Engineering Technology	31 43.0	12 16.7	8 11.1	8 11.1	12 16.7	1 1.4	72 100.0%
Gas Plant Operation	31 43.0	14 19.4	1 1.4	3 4.2	9 12.5	14 19.5	72 100.0%
Field Operations	41 56.9	12 16.7	8 11.1	5 6.9	4 5.6	2 2.8	72 100.0%
Laboratory	54 75.0	17 23.6	0 0.0	1 1.4	0 0.0	0 0.0	72 100.0%
Construction	55 76.4	14 19.4	2 2.8	1 1.4	0 0.0	0 0.0	72 100.0%
Transmission	60 83.3	10 13.9	1 1.4	1 1.4	0 0.0	0 0.0	72 100.0%
Other	56 77.8	6 8.3	3 4.2	0 0.0	0 0.0	7 9.7	72 100.0%

Table ~~16~~

Distribution of Graduates According to Time Spent in Different Employment Areas in First Job After Graduation
N = 33

Area of Work	Percentage of time spent in each area						
	0.0%	1-24%	25-49%	50-74%	75-99%	100.0%	Totals
Engineering Technology	16 48.5	6 18.2	3 9.1	7 21.2	0 0.0	1 3.0	33 100.0%
Gas Plant Operation	17 51.5	5 15.2	1 3.0	4 12.1	2 6.1	4 12.1	33 100.0%
Field Operations	17 51.5	4 12.1	5 15.2	5 15.2	1 3.0	1 3.0	33 100.0%
Laboratory	26 78.8	4 12.1	2 6.1	0 0.0	0 0.0	1 3.0	33 100.0%
Construction	25 75.8	4 12.1	4 12.1	0 0.0	0 0.0	0 0.0	33 100.0%
Transmission	31 94.0	2 6.1	0 0.0	0 0.0	0 0.0	0 0.0	33 100.0%
Other	24 72.8	1 3.0	1 3.0	3 9.1	3 9.1	1 3.0	33 100.0%

Field operations. A total of 31 graduates indicated they spent some of their time working in the area of field operations, which includes such tasks as wells and systems operations, well testing, and wells and systems maintenance. Of all respondents, 8.4 percent spent 75 percent or more, 6.9 percent spent between 50 and 75 percent, 11.1 percent spent between 25 and 49 percent, and 16.7 percent spent less than 24 percent of their time working in this area.

Laboratory. There were 25 percent of the graduates who indicated they spent some of their time working at a laboratory job. Of all respondents, 1.4 percent spent over 50 percent, while 23.6 percent spent less than 25 percent of their time working in this area.

Construction. A total of 23.6 percent of the graduates spent some of their time working in construction, with 4.2 percent spending between 25 and 75 percent, while 19.4 percent spent less than 25 percent of their time in this area of work.

Gas transmission. Of all respondents, 2.8 percent spent between 25 and 75 percent, while 13.9 percent spent less than 25 percent of their time in this area of work.

Other activities included reservoir work; sale of gas compressors, air compressors and pumps; environmental control; chemical operations in a heavy water plant; metallurgical engineering; and radio operations as a station master.

In summary, the three work areas drawing the largest number of graduates were engineering technology (57 percent), gas plant operations (57 percent), and field operations (47 percent). Between 16 and 25 percent indicated spending time in gas transmission, construction, and laboratory work.

Degree of Satisfaction with Present Job

Satisfaction or moderate satisfaction was expressed by 89.8 percent of the respondents, while the remaining 10.2 percent were either indifferent or dissatisfied (Table 17).

Space was provided on the questionnaire for comments and 41 of the 82 graduates wrote in additional information about their attitudes toward their jobs (Appendix C).

Favorable comments referred to the challenging features and responsibilities of the job:

"My present position as Plant Foreman is very challenging."

"Extremely interesting in that it is a new field with limitless opportunities for advancement."

"The gas technology course seemed personally geared for my present job."

"I like the engineering work that I do immensely, as I get into almost all aspects of oil production engineering."

Graduates who had marked moderately satisfied, indifferent, or dissatisfied expressed varying degrees of dissatisfaction with their jobs. These dissatisfactions seemed to arise from either under-utilization of their expertise, or a perceived lack of

Table 17

Distribution of Graduates According to Degree of Satisfaction with Present Job
N = 78

Degree of Satisfaction	Number of Responses	Percent of Total
Satisfied	40	51.3
Moderately satisfied	30	38.5
Indifferent	4	5.1
Dissatisfied	4	5.1
Total	78	100.0

opportunity for advancement in their field.

Comments reflecting feelings of under-utilization included:

"There is not enough responsibility."

"I quit the Gas Industry because I could see that it was nothing but a dead end for Technologists as no recognition was given to anyone who was not an engineer. The engineers I worked with thought all technologists were file clerks and personal secretaries for them. That was NOT what I was trained for."

"My employer does not seem to use my knowledge and training as much as he could."

There were also many criticisms of the perceived lack of promotional opportunities which some saw as resulting from the engineers acting as mobility blocks to their careers. Examples are given below:

"My chance for advancement is limited. I'm always competing with professional engineers."

"I'm competing with engineers."

"I'm disappointed in the fact that it was after I started the job that I found out technologists in engineering departments are at a dead end as far as advancement, but other than that I enjoy the work."

In summary, about 90 percent indicated general satisfaction. The other respondents were largely dissatisfied over prospects and the limited challenge of the tasks they were assigned.

Plans for Occupational Future

Another indirect indicator of occupational satisfaction would be the graduates' plans for the future. Table 18 contains the distribution of responses by graduates to this question.

A total of 70.9 percent planned to stay in their present occupational field, while 10.1 percent clearly planned to move to some other field. The remaining 19 percent gave other responses. Some of the comments explained why they had checked "other" on the question. A number had already changed occupational fields, or were in the process of doing so. Career aspirations among those changing included teaching, engineering, accounting, and self-employment.

Membership in a Professional Organization or a Trade Union

Displayed in Table 19 is the distribution of graduates who indicated they held memberships in professional organizations or trade unions. Because of the possibility of multiple responses, a count was made to see how many graduates had actually responded to this item (Question 18, Appendix B). This revealed that a total of 25 graduates had responded, with two of these indicating two memberships and one indicating three memberships. The Alberta Society of Engineering Technologists had the largest number (18) of graduates as members. Only two graduates indicated membership in a trade union.

Table 18

Distribution of Graduates by Plans for Occupational Future

N = 79

Plans for Occupational Future	Responses	Percent of Total
Remain in present field	56	70.9
Shift to another field	8	10.1
Other response	15	19.0
Total	79	100.0

Table 19

Distribution of Graduates According to Membership in a Professional Organization or a Trade Union
N = 82

Organization in which membership is held	Responses	Percent of Total
The Alberta Society of Engineering Technologists	18	22.0
Trade Union	2	2.4
Association of Professional Engineers	4	4.9
Other	5	6.1
Total	29	35.4

Summary

While employer sponsored training was the most common upgrading graduates had experienced (52.4 percent) the most popular plan for future training involved upgrading of steam engineering qualifications (36.6 percent).

Graduates most frequently (53.2 percent) credited Canada Manpower with helping them obtain their first job. A total of 68.3 percent of graduates were still working at the first job they had obtained upon graduation.

Though most graduates (77 percent) indicated they had received promotions, only 14.6 percent had been promoted to positions supervising others. Along with the promotions came pay increases and 1965 graduates averaged incomes of 850 dollars per month as compared with 713 dollars per month for 1971 graduates.

The work areas occupied by the largest number of graduates were engineering technology (57 percent), gas plant operations (57 percent), and field operations (47 percent).

A total of 89 percent of the graduates indicated satisfaction with their jobs with 70.9 percent indicating they planned to stay in their present occupational field.

Membership in professional associations and unions was very low, with the largest number of graduates (22 percent) indicating they held membership in the Alberta Society of Engineering Technologists.

GRADUATES OPINIONS OF THE VALUE OF NAIT TRAINING

This part of the study analyses the responses of the graduates to questions eliciting information about their opinions of the value of their NAIT training.

The set of questions used are the same ones responded to by the supervisors, and it was a comparison of the graduates' and supervisors' responses that constituted an important part of the Ottley thesis (1973). The analysis provided in the present study limits itself to a description of the responses of the graduates.

Maintenance of Competence

Graduates were asked to indicate how graduates employed in their company might best maintain a level of training ideal for both themselves and the company. The two most frequently chosen responses were the part time extension courses at post-secondary institutions chosen by 48.6 percent, and company sponsored training programs chosen by 37.8 percent (Table 20).

Of the six (8.1 percent) respondents who thought it best to learn from experience, three included written qualifiers. One thought institutional courses "apply also to a degree, but gaining experience on the job is most important." A second suggested experience should be supplemented with "lectures in steam engineering." The third noted that the "company gives school (process training) on the job site."

Table 20

Distribution of Graduates According to Their Opinion of Best Way to Maintain an Adequate Level of Training
N = 74

Type of Training	Responses	Percent of Total
Part time extension courses at formal institutions such as University, NAIT, SAIT	36	48.6
Company sponsored training programs	28	37.8
Self study through trade or professional journals	2	2.7
No study necessary- just keep eyes and ears open	6	8.1
Other	2	2.8
Total	74	100.0

Comparison with Employees Having no Technical Training

Reported in this section are the distribution of responses of graduates to questions asking them to evaluate their training by comparing the advantages they have when compared to employees having equal experience but lacking their formal training.

Quality of preparation for first job. When compared to other new employees having equal experience but lacking their formal training, 76.6 percent of the respondents indicated they considered themselves better prepared, while 5.2 percent thought themselves less well prepared for their first job (Table 21).

A look through the comments written on their questionnaires suggested some explanation for those who thought themselves less well prepared. One wrote the "gas technology course does not really prepare one for operating until sufficient experience is gained and some background can be used." Another suggested that "in the engineering field a better course in sentence structure (English) would be most helpful in writing letters and reports." These comments seem to suggest that in individual cases graduates have found themselves competing with individuals who may have superior skill in the use of English, or who may have mechanical backgrounds, or experience, which meant the graduate perceived himself as less well prepared for that particular job.

Quality of first job. The distribution of responses displayed in Table 22 reveals that 44.6 percent of the graduates

Table 21

Distribution of Graduates According to How Well Prepared They Were to Handle Their First Jobs Compared to Other New Employees Having Equal Experience But No Formal Technical Training
N = 77

Degree of Preparedness	Responses	Percent of Total
Better prepared	59	76.6
About as well prepared	14	18.2
Less prepared	4	5.2
Total	77	100.0

Table 22

Distribution of Graduates According to Their Perceptions of How Beginning Jobs of Graduates Compare with the Beginning Jobs of Other Employees Having Equal Experience But no Formal Technical Training
N = 76

Degree of Preparedness	Responses	Percent of Total
Better jobs	34	44.8
Similiar jobs	28	36.9
Poorer jobs	3	3.9
Don't know or undecided	9	11.8
Other	2	2.6
Total	76	100.0

thought they had obtained better jobs as a result of their training, 36.9 percent thought they had obtained similiar jobs, and 3.9 percent thought they had obtained poorer jobs. Thus it would appear that almost half of the graduates thought their training gave them no significant advantage in obtaining better first jobs.

On-the-job training requirements of graduates. A total of 60.5 percent (Table 23) of the graduates thought they required either less, or much less, on-the-job training than other employees, while 35.5 percent thought the amount of training required was about equal.

Promotional records compared. There were 57.1 percent (Table 24) of the graduates who thought their promotional record was better, or much better than other employees, while 38.6 percent thought their records were about the same.

Comments. Problems in making their choice of responses to Questions 20 through 24 (Appendix B) were indicated by the many comments graduates wrote into the spaces provided on the questionnaire.

These comments suggested that some graduates felt the training was less important than individual characteristics. This was summed up by one graduate who wrote: "It depends much upon the individual — some are better, some are poorer."

Other comments related to the perceived importance of on-the-job experience. One graduate wrote: "While education has

Table 23

Distribution of Graduates According to Amount of On-the-Job Training Required by Graduates on Their First Job* Compared with Employees Having Equal Experience but no Formal Technical Training

N = 76

Amount of Training Required	Responses	Percent of Total
Much more	1	1.3
More	2	2.6
As much as	27	35.5
Less	39	51.3
Much less	7	9.2
Total	76	100.0

*Graduates were asked to answer this item only if their first job was related to their training.

Table 24

Distribution of Graduates According to How Their Promotional Record Compares with That of Other Employees Occupying Similiar Positions But Having No Formal Technical Training

N = 70

Promotional Record	Responses	Percent of Total
Much better	12	17.1
Better	28	40.0
As good as	27	38.6
Poorer	3	4.3
Total	70	100.0

given the Gas Technologist an advantage, he must realize that only experience will show him how little he actually knows." Another suggested: "Graduates should have on-the-job training before completion of the course." A third also expressed the need for experience as follows: "... A person needs so much practical experience and a graduate does not have this, he starts at the same level as anyone else."

Most comments were, however, suggestive of the value of the training provided by NAIT. Examples of such opinions included the following:

"Generally speaking the technical graduate is better qualified and can grasp new ideas and concepts quicker."

"They require on-the-job training but catch on quicker than those with no technical training."

"In operations a graduate has an understanding of the theory, therefore this aids him in his work whereas as nongraduate knows little or nothing of theory."

Summary. Approximately one-half of the graduates considered the training they received at NAIT to have given them an advantage over other new employees having equal experience but no technical training, with 76.6 percent indicating they were better prepared, 44.8 percent indicating they obtained better first jobs, 60.5 percent indicating they required less on-the-job training, and 57.1 percent concluding their promotional records were better.

Best Employment Area for Graduates

When asked to indicate their view of the employment area offering the best opportunity for advancement in their company, 56.9 percent of the graduates selected gas plant operations, 27.8 percent chose engineering technology, and 11.1 percent chose field operations (Table 25).

Comments written by graduates give suggested explanations for the choices made. Some thought gas plant operations offered the best advancement opportunities because there were no engineers to block advancement as summarized by one graduate: "There are many operators in a gas plant all having the same basic qualifications. An engineering technologist will never advance above the engineer." Another suggested the same point: "Field and plant seem to be the only areas for technical graduates as engineers seem to receive other jobs."

Another reason some thought operations was the best choice was their feeling there was a greater demand for people in this area. This was expressed as follows:[7]

> During the last few years, the positions once readily available in the Engineering technology area are now becoming scarce and recent graduates are now having to fall in behind fellow technologists some of whom have 6 to 8 years of experience. Conversely, due to the rapid increase in the numbers of natural gas plants, a technologist in this area can easily advance through the operations ranks to positions such as shift foreman or operating supervisors in a relatively short period of time (i.e. 5-10 years).

Those who thought the best opportunities arose out of a field operations position seemed to base their choice on their view that the experience gained in field operations could be turned

Table 25

Distribution of Graduates According to Their Views of the Employment Area Offering the Best Opportunity for Advancement in Their Company

N = 72

Employment Area	Responses	Percent of Total
Engineering technology	20	27.8
Gas plant operations	41	56.9
Field operations	8	11.1
Other	3	4.2
Total	72	100.0

to promotional opportunities. In one graduates words:

> It is essential to have a good field background. With good experience, you can transfer to an office where your background could be an asset, or remain in field operations. There is a demand for good men in both areas.

Comments included with those who indicated engineering technology positions might be the best positions suggested that even among those making this choice there were reservations. One suggested there would be "...about equal opportunity in (a), (b) and (e)." Another thought "(a) will give faster promotions and lead to a titled position but (b) will give a faster financial return." Another suggested that in the company he worked for, the graduate working as an engineering technologist would be given experience in the other areas and would thus have a broader range of experience than a graduate working specifically in plant operations, field operations, construction, or other areas, thus he would be able to obtain a promotion to a higher position.

Evaluation of NAIT Curriculum

Described in this section are the responses of graduates to questions asking them to evaluate the NAIT Gas Technology curriculum in terms of: (1) its usefulness in preparing them for particular areas of work; (2) the usefulness of individual subjects included in their course work at NAIT; and, (3) their view of the general type of training that should be stressed in the program.

Usefulness of NAIT training in job preparation. A total of

89.8 percent of the respondents rated their training as useful, or very useful in preparing them for work in the area of engineering technology, while 3.8 percent rated the training of little or no use (Table 26).

Their training at NAIT was rated as useful or very useful as preparation for work in the area of gas plant operation by 87.2 percent of the respondents, while 9 percent rated their training of little or no use.

NAIT training was seen as useful, or very useful as preparation for work in field operations by 70.5 percent of the respondents, while 24.4 percent rated such training as of little or no use for this area of work.

As preparation for laboratory work NAIT training was considered useful, or very useful, by 60.2 percent of the graduates, while 27 percent thought such training of little or no use.

A total of 44.8 percent of the graduates rated their training as useful, or very useful, in preparing them for work in construction, while 46.2 percent rated their training of little or no use for this area of work.

Gas transmission is seen as a work area in which NAIT training is useful, or very useful, by 59.2 percent of the respondents, while 25 percent thought such training of little or no use as preparation for this area of work.

Usefulness of subjects to success on job. The distribution

Table 26

Distribution of Graduates According to How They Rate NAIT Training as to Its Usefulness in Preparing Them for Work

Area of Work		Very Useful	Useful	Of Little Use	Useless	Don't Know	Total
Engineering	n =	40	31	2	1	5	79
technology	% =	50.6	39.2	2.5	1.3	6.4	100.0
N = 79							
Gas plant	n =	23	45	5	2	3	78
operation	% =	29.5	57.7	6.4	2.6	3.8	100.0
N = 78							
Field	n =	7	48	18	1	4	78
operations	% =	9.0	61.5	23.1	1.3	5.1	100.0
N = 78							
Laboratory	n =	10	37	19	2	10	78
N = 78	% =	12.8	47.4	24.4	2.6	12.8	100.0
Construction	n =	6	29	30	6	7	78
N = 78	% =	7.7	37.1	38.5	7.7	9.0	100.0
Transmission	n =	7	38	18	1	12	76
N = 76	% =	9.2	50.0	23.7	1.3	15.8	100.0

of the responses of graduates to a question asking them to rate the usefulness of certain curriculum areas to their success on the job is displayed in Table 27, and is described below. The areas are discussed from highest to lowest ranking in terms of their rated importance. The rankings were calculated by adding together the number of respondents who identified each subject as useful or very useful.

a. Gas processing. This curriculum area was rated very useful for job success by more graduates than any other, with 61.3 percent giving it this rating, while another 30.7 percent rated it as useful. Only 6.7 percent of the respondents rated it of little or no use.

b. Instrumentation (including electronics). This subject area was rated very useful by 50 percent of the respondents; useful by 40.8 percent; and of little or no use by 9.2 percent.

c. English. English was rated very useful by 44.6 percent of the graduates and useful by 41.6 percent, while 23.3 percent rated it of little or no use to their success on the job.

d. Chemistry. Chemistry was rated as very useful for job success by 27.3 percent of the respondents; as useful by 58.4 percent; and as of little or no use by 14.3 percent.

e. Mathematics. This subject was rated very useful by 35.1 percent of the graduates; useful by 49.3 percent; and of little

Table 27

Distribution of Graduates According to Their Rating of the Usefulness of Curriculum Areas to Their Success on the Job

Curriculum Area	Very Useful	Useful	Little Use	Useless	Don't Know	Total
Gas Processing (N = 75)	61.3	30.7	5.4	1.3	1.3	100.0%
Instrumentation (N = 76)	50.0	40.8	7.9	1.3	0.0	100.0%
English (N = 77)	44.2	41.6	9.1	3.8	1.3	100.0%
Chemistry (N = 77)	27.3	58.4	10.4	2.6	1.3	100.0%
Mathematics (N = 77)	35.1	49.3	13.0	2.6	0.0	100.0%
Gas Transmission (N = 75)	18.7	50.7	22.6	4.0	4.0	100.0%
Power Plant Engineering (N = 75)	36.0	32.0	25.3	4.0	2.7	100.0%
Physics, including Electricity (N = 76)	14.5	50.0	28.9	5.3	1.3	100.0%
Fortran (N = 76)	7.9	27.6	25.0	31.6	7.9	100.0%

or no use to job success by 15.6 percent.

f. Gas transmission. This area was rated very useful by 18.7 percent; useful by 50.7 percent; and as of little or no use to job success by 26.6 percent of the respondents.

g. Power plant engineering. This curriculum area was rated as very useful to a graduate's success on the job by 36 percent; useful by 32 percent; and of little or no use by 29.3 percent.

h. Physics (including electricity). This subject area was rated very useful to job success by 14.5 percent of the graduates; useful by 50 percent; and either useless or of little use by 34.2 percent of the respondents.

i. Fortran. Fortran was rated very useful by 7.9 percent; useful by 27.6 percent; and of little or no use to job success by 64.5 percent of the respondents.

In summary, English, Mathematics, Chemistry, Instrumentation, and Gas Processing, were all rated as useful, or very useful, by over 80 percent of the respondents; while Physics, Gas Transmission, and Power Plant Engineering were all rated as useful, or very useful, by over 60 percent of them. Fortran was rated useless, or of little use by 56.6 percent of the respondents.

Comments made by students tend to support the rankings, but also included suggestions. The instrumentation course was criticized in a few comments made by the graduates. One suggested:

"... a better instrumentation section should be added to the curriculum — that is practical instrumentation where one can actually work with instruments."

Another area that received criticism was the alleged lack of "... practical courses to do with actual field work and workovers." In response to this same need another graduate thought more actual field work might be provided through summer employment, presumably between the first and second year of the program.

Curriculum Emphasis

A total of 53.9 percent of the respondents thought that the emphasis of the NAIT Gas Technology Curriculum should be on the development of the ability for self-education and adaptability, while 25.6 percent indicated the teaching of basic principles should be the major emphasis. A smaller 20.5 percent thought the emphasis should be on the teaching of skills resulting in graduates requiring little or no on-the-job training (Table 28).

Development of the ability for self-education, basic principles only, and skills are each ranked second by exactly one-third of the respondents, while emphasis on skills was ranked third by 46.2 percent of the graduates, emphasis on basic principles was ranked third by 41 percent, and development of self-education abilities was ranked third by 12.8 percent of the respondents.

Another way of comparing choices is to weight first choices one, second choices two, and third choices three. By

Table 28

Distribution of Graduates According to Their View of the Desirable Curricular Emphasis
N = 78

Curricular Emphasis	Rank	Ranked by Percent of Total			Total
		First	Second	Third	
Development of ability for self-education and adaptability	1.59*	53.9	33.3	12.8	100.0%
Basic principles only	2.16	25.6	33.3	41.1	100.0%
Skills so graduate needs minimum of on-the-job training	2.26	20.5	33.3	46.2	100.0%

*Computed as follows: $\frac{(42x1) + (26x2) + (10x3)}{78} = 1.59$

with 53.9 percent of 78 = 42; 33.3 percent of 78 = 26; and 12.8 percent of 78 = 10.

multiplying the number who rank each item by the weighting and then adding these totals and dividing by the total number of responses it becomes possible to compare rankings. By this calculation, the development of the ability for self-education gets a ranking of 1.59; the development of basic principles gets a ranking of 2.16; and the development of skills gets a ranking of 2.26; again revealing the fact that the graduates tend to rather markedly favor a program emphasizing the development of ability for self-education and adaptability.

Recommendation of the Gas Technology Program

A total of 75 percent of the respondents indicated they would recommend the Gas Technology program at NAIT to a potential student, while 12.5 percent indicated they would not be willing to recommend it (Table 29).

Of those who did not recommend the program or were undecided, a few included comments. One graduate who would not recommend the Gas Technology Program would instead recommend "instrumentation or a trade." Another suggested the inclusion in the program of a third class steam course. A third graduate who would not recommend the program complained of a lack of recognition by the oil companies and stated: "...Some oil companies hire Gas Technologists to do maintenance work without trying to make use of their education."

Comments from those who were undecided revealed some similiar concerns. One wrote: "I cannot comment at this time

Table 29

Distribution of Graduates According to Whether
They Would Recommend the Gas
Technology Program
N = 80

Recommendation	Responses	Percent of Total
Yes, would recommend	60	75.0
No, would not recommend	10	12.5
Undecided	10	12.5
Total	80	100.0

because the opportunity to use much of the course content to any appreciable extent has not occurred yet." Another suggested more time should be given to instrumentation courses. A third felt the second year should be divided into two programs; a practically oriented operational type gas technology program and a design gas technology, with the latter program having a mark requirement of a 65 percent average in first year for admittance.

Improvements to Program

An open ended question asked graduates to suggest ways the Gas Technology Program at NAIT might be improved. Some of the ideas suggested are included here. A few are developed in more length in Chapter 6.

Suggestions by graduates can be grouped into those dealing with relationships between the program and the external environment and those suggesting changes in the program itself.

External environment. Some of the earlier graduates suggested improvements in the transfer arrangements with the university. These appear to grow out of a feeling among many graduates that engineers block promotional opportunities for graduates who choose to work as engineering technologists. One summed up this feeling when he wrote:

> In its present state the technology field is very limited and a broader engineering degree is desirable if the student wishes to continue. This should be done in conjunction with a university so a smooth transition would be possible.

Others focused on the need for the education of industry to proper recognition of their skill and consequent ability to contribute, as summarized by one graduate who wrote: "Educate the industry to what a gas graduate can do." While others echoed much the same refrain, none made concrete suggestions about how this might be accomplished.

Program changes. Suggestions for improving the program varied from changes in emphasis in the program to the introduction of optional special programs for second year students.

Some wanted more emphasis on plant operations and the problems associated with this area. Others suggested either an improvement in the instrumentation part of the program or its complete deletion, with the argument that a little knowledge is a dangerous thing. Several commented on the need for more emphasis on the communication skills. There were also those who stressed the need for more application during training through the use of labs, field trips, and related summer employment.

A recurring suggestion was that the second year of the program allow for specialization, with one suggestion being to divide the second year into a technology program and an operations program.

Summary

Graduates' opinions of the value of their training at NAIT were generally quite favorable. This was suggested by the fact that 48.6 percent indicated the best way to maintain a high level of competence was through courses offered at post-secondary institutions such as NAIT or the university. Their favorable opinion was also revealed in that when asked to compare graduates with other employees lacking their training, 76.6 percent indicated they thought graduates were better prepared for their first job, 81.5 percent thought they had obtained as good or better first jobs, 60.5 percent thought they required less on-the-job training, and 57.1 percent thought their promotional records were better.

Gas plant operations was considered the best employment area for graduates by 56.9 percent of the respondents, engineering technology was considered best by 27.8 percent, and field operations was considered best by 11.1 percent.

The NAIT curriculum was evaluated as useful or very useful in preparing graduates for work in the areas of: 1) engineering technology by 89.8 percent of respondents; 2) gas plant operations by 87.2 percent of respondents; 3) field operations by 70.5 percent of respondents; 4) laboratory work by 60.2 percent; 5) gas transmission by 59.2 percent, and 6) construction by 44.8 percent of respondents.

Subjects judged useful or very useful for job success by over 80 percent of the respondents were English, Mathematics, Chemistry, Instrumentation, and Gas Processing; subjects judged useful or very useful by over 60 percent were Physics, Gas Transmission, and Power Plant Engineering. Fortran was rated as of little or no use by 56.6 percent of the respondents.

The development of an ability for self-education and adaptability was the preferred curriculum emphasis for a majority of the respondents.

The many written comments and suggestions revealed a continuing positive interest in the gas technology program by the graduates and some of the ideas raised are discussed in chapter 6.

Chapter 6

DISCUSSION OF FINDINGS

Some of the implications arising out of the findings of this study are discussed in this chapter. Ideas dealt with were drawn from an examination of the data presented in tables in chapter 5 and the written comments of the many graduates who chose to express their ideas more fully in the spaces provided on the questionnaire. The sequence of presentation follows the natural transition of the student from recruitment, through training, to employment and career development.

Recruitment of Students

The findings give little guidance for the recruitment of students into the program. From the data gathered in this study there appears to be no one agency or class of person that could be termed "most influential" in the potential students choice of the Gas Technology program. This suggests that distribution of information to potential students should be done through all the available channels rather than being focused through any one group.

The findings might also suggest, however, that high school counsellors are not being provided with enough detailed information regarding the program to provide meaningful direction or help to those students who make inquiries regarding the program. If this is true, a special effort might be made to provide high school counsellors with complete information about the program and the career opportunities opened up by graduation from it.

Orientation of Students

According to the findings of this study, 52 percent of students who came to the Gas Technology program did so with less than one year out of school. This combined with the low entrance age indicates these students entered the program with little work experience. This lack of experience suggests that program orientation requires a quite detailed and pointed approach to ensure that entering students have a clear idea of the varied career opportunities that will be opened to them as well as the problems they may face.

The students should also be provided with the opportunity to see at first hand the type of jobs that will be available. Some of the graduates suggested that during the first year of the program more tours should be arranged so students have the chance to acquire information about the various jobs available in the gas industry. Other graduates thought students should be required to work in the gas industry between the first and second year of the Gas Technology program. Implied in these suggestions was the idea that such experience would provide a base of information useful in the selection of a job upon graduation.

Program Emphasis

Results of this survey indicated that 79 percent obtained additional training after graduation. These findings, together with the written comments of graduates, leads to the conclusion that the program emphasis should be on the development of an ability for self-education and adaptability on the part of graduates rather than a too narrow focus on specific job skills.

A reading of the many suggestions made by graduates seemed to suggest, however, that within the framework of such an emphasis, it might be possible to provide more opportunities for students to be made aware of alternative career lines and specific job requirements in the various positions available to graduates. Three related suggestions might serve this purpose.

One would be to include in the first year of the program tours designed to show the students the types of jobs available to graduates as well as identifying for the students some of the skills they would need for the jobs observed.

A second suggestion would be to arrange, either as an option or as a requirement, that students work in the gas industry during the summer between the first and second year of the program. Such experience would provide them with first-hand exposure to the job requirements of some part of the gas industry, and should therefore provide students with valuable information in their selection of a suitable job upon graduation.

A third suggestion would be that options or specialization opportunities be set up in the second year of the program. If such choices were developed it would appear that the tours and work experience suggested would provide the students with valuable information, particularly when combined with their first year courses, for making wise decisions regarding their area of specialization.

The impression gained, then, when one studies the responses of graduates, is that the program emphasis on the development of self-education skills should be continued, but that an awareness of needed skills and job opportunities should be provided for in the program through such means as tours, related summer work experience, and an opportunity for specialization in the second year of the program.

Program Evaluation

Most graduates (76.6 percent) viewed themselves as better prepared for their jobs after graduation than other employees having no more experience but lacking their technical training. This high rating suggests a positive view of the program offered. However, only 44.6 percent thought this superior preparation had actually been translatable into a better job.

The NAIT training was judged useful to very useful as preparation for engineering technology and gas plant operation by over 85 percent of the respondents. This high positive rating suggests the program is doing a very good job in its preparation of students for these fields of work. Since they are the two areas of work that the program has focused on, this speaks well for both the program and the people teaching it.

Another aspect of program the graduates were asked to evaluate was the usefulness of specific subjects to success on the job. Gas Processing, Instrumentation, English, Chemistry, and Mathematics were the subjects ranked most useful. Fortran was the one seen as least useful with only 35.5 percent rating it as useful or very useful. No clear reason emerged to explain this low rating. Speculation would suggest that either few graduates come in contact with computers or that the course itself was either poorly designed or poorly taught.

Graduates implied by their response patterns that they rank the program quite highly when 75 percent of them indicated they would recommend the program to someone asking them for advice who was considering entering the program.

Role of Canada Manpower

Over half (53.2 percent) of the graduates indicated Canada Manpower had been the key agency in helping them obtain their first job. During the years surveyed, Canada Manpower became increasingly important to Gas Technology graduates as a source of jobs.

While such data suggest that Canada Manpower is doing an increasingly effective job in the placement of graduates, the question that can be raised is what effect this has on the role of the Gas Technology section. Is there danger that as time goes by the section may have its contacts with the gas industry weakened, and thus lessen feedback from industry? Or is it more likely that a close liaison will develop between the section and Canada Manpower which will be mutually beneficial and will result in the section being freed from some pressures and thus having more opportunity to spend time in getting information in other ways? Might Canada Manpower bring together employer representatives of the gas industry and the instructors and administrators in the Gas Technology area? Only an investigation of this area would result in a clarification of the benefits and problems associated with a closer liaison between the Gas Technology section and Canada Manpower.

Job Mobility

According to the data gathered, 68.3 percent of the graduates obtained jobs at graduation with a particular company and stayed with that company. Speculation on the reasons for this relatively low mobility rate lead to a number of possibilities.

The first might be to conclude that the jobs obtained are satisfying and therefore there is no reason to move. Another explanation might be that their jobs are of such a nature that they have little opportunity to learn of the availability of other jobs. A third possibility might be that the jobs themselves are scattered geographically, so graduates resist changing jobs to avoid moving. Information gathered in this survey does not provide an answer to the low mobility rate, but some of the data do raise other questions.

The reported average pay rates for 1965 graduates was 850 dollars per month, while the average starting salaries for the 1971 graduates was 710 dollars. In other words the average pay for those graduates with extensive experience is only 19.7 percent higher than are the salaries of the more recent graduates with little experience. The lack of mobility mentioned previously raises the question of why graduates have been satisfied to stay in jobs were salaries paid to experienced people are so near to the salaries paid to recent graduates. Maybe it is difficult for individual graduates to ascertain their worth and negotiate higher salaries because they have no other employment group as a clear reference group. Or is it possible that the training they are receiving is too narrowly technical to provide them with the skills necessary to negotiate higher incomes?

Answers to the questions raised would require additional research focusing on the mobility and economic dimensions of employment in the gas technology industry.

Membership in Professional Associations and Unions

The low level of interest in membership in professional associations suggests that either such associations meet few of the needs of graduates, or that the graduates are unaware of the services offered and advantages gained through membership in such associations. If the latter is the explanation, it would seem to be desirable to provide students with information about potential services provided by such memberships. An aggressive program of recruitment during student days might be useful in introducing students to these associations.

Maintenance of Professional Competence

The fact that almost half of the graduates perceive courses taken at universities and technical institutes as being the best way to maintain professional competence suggests the importance of NAIT examining from time to time the demand for courses or programs designed to upgrade the training level of graduates. Such programs might be set up through the cooperation of the Extension Division at NAIT and the Gas Technology section.

Upgrading of Qualifications

The large number of graduates who planned to upgrade their qualifications (77 percent) raises the question of what their reasons are for such plans. Do such plans arise out of an appreciation developed while at NAIT for the importance of education in career development or do they arise as a result of experiences which lead them to conclude they lack certain qualifications necessary for success in the gas industry?

If such plans arise out of an appreciation for the role of education in career development it would appear that NAIT is doing an excellent job in creating such an awareness. But if the motivation to make such plans arises out of a feeling they are poorly qualified for their jobs, or that they lack specific qualifications for positions which interest them, the question can be raised as to whether it might be possible to modify the program in such a way as to offer students such training before they become full-time employees. Investigation would be necessary to determine whether any of these interests could be met within the existing framework provided by the NAIT Gas Technology program.

Attitudes toward Job

Though most graduates are well satisfied with their jobs, some felt they were not being provided with the challenge in the job they had expected and others expressed the feeling that their promotional opportunities were being blocked by engineers. There seems to be evidence that some older graduates may have responded to feelings of blockage by attending university in order to obtain their engineering degrees. A total of 28 percent of the 1965 through 1968 graduates reported they were either working on or had completed such degrees, while none of the graduates from 1969 through 1971 reported being involved in such programs.

Changes in approach which might reduce feelings of frustration among graduates include the following. The program might be upgraded so that graduates would get more transfer credit toward a university degree (See Ottley, 1973:137-138 for details of current arrangements with the University of Alberta and other institutions). At the present time, a graduate with an excellent academic record is granted up to one years credit toward an Engineering degree at the University of Alberta for the courses taken in his Gas Technology program.

A second approach might be to try to clarify the expectations of students. This could be attempted either through group discussion sessions or through individual interviews. Such sessions could be conducted by the instructors in Gas Technology with guidance from student counselling services available at NAIT. To succeed in this a carefully planned program involving both years of the program would likely be needed. But improving transferability or attempting to clarify the expectations of students both could present difficulties.

In the first case, to change the program to improve transferability would be to change the objectives of the program (Appendix C). This would mean that rather than changes in the program arising out of industry need the changes would become more and more influenced by changes dictated by the university's needs.

The problems involved in developing more realistic expectations are also real. At the time of this survey some graduates were obtaining jobs which provided them with opportunities for advancement. To suggest to current students that they shouldn't set their sights so high might be to destroy the power of motivation involved in emulation. To trace clearly the career lines followed by successful graduates and to familiarize the students with these potential career lines could also result in frustration, both because the career lines are not clearly established, and because even if they were clear, they would be subject to change, which might mar their usefulness as guides to students.

The most sensible approach would seem to be to provide the students with accurate, objective information about what graduates have accomplished, or failed to accomplish, and then let the students interpret this information in light of their knowledge of themselves. Staff involvement in research in the form of follow-up studies would generate the information needed for this type of approach, and would ensure that the people best able to provide the information to the students would be the ones with the detailed knowledge provided by such follow-ups.

Another approach is to look at the relationship between graduate complaints and the expressed satisfactions with the jobs held. Here it is interesting to note that in spite of the previously noted narrow range in salary spread between inexperienced graduates and those with extensive work experience, 89.8 percent of the graduates indicated they were moderately or totally satisfied with their jobs. Dissatisfactions expressed in the form of written comments usually made reference to blocked promotional channels or feelings of under-utilization in that their jobs had become boring or routine, rather than specific dissatisfactions with rates of pay, though blocked promotional opportunities do imply a lack of opportunity to gain positions that would pay better.

The relatively high number (28 percent of 1965 through 1968 graduates) who indicated they had either completed or were working on engineering degrees indicated that some of the lack of opportunity for more experienced workers to gain recognition for their experience may lead to positive steps. Others working on upgrading programs may also be responding to a recognition that experience alone may lead to little recognition. Again the data gathered in this survey merely suggests a potential problem area, but fails to provide sufficient information to clearly indicate whether the suggested dissatisfactions are related, or if related, what the relationship is.

Another interpretation of the dissatisfactions discussed might be that the Gas Technology program produces the type of graduate who is ambitious and who actively pursues change. His methods of achieving change are through upgrading his qualifications by taking engineering courses or working on courses leading to upgrading of the steam certificate. Such an interpretation would focus on the idea that dissatisfaction, if it leads to action, is a powerful motive for positive change. The data in this study would seem to support the idea that much of the dissatisfaction is of a positive nature [illegible] that it has led to positive action (upgrading of qualifications) though admittedly there does not seem to be evidence of widespread job mobility.

Conclusion

The original purpose of this study was to obtain information from graduates which would be useful in evaluating the Gas Technology program. In general, it appeared from this survey that the program provided at NAIT does a good job of achieving its objectives (Appendix C), but some suggestions did arise.

In the area of recruitment of students and their orientation into the program it would appear that attempts should be made to ensure that students entering the program are fully aware of its nature and the nature of employment opportunities created by completion of the program.

Emphasis in the program should continue to be on the development in the student of a flexibility which allows him to take advantage of changing opportunities, at the same time that he is ensured an opportunity to develop the skills he will need. A program designed to incorporate laboratory experiences, tours, and work experience, seems most appropriate for providing the suggested blend of flexibility and developed skills.

If Canada Manpower is to play an important role in job placement, including both summer and full-time employment, then it is important that the liaison between the Gas Technology section and Canada Manpower be of such a nature as to develop and maintain contacts between the Gas Technology instructional staff and industry representatives. Functioning in this way Canada Manpower can be an important team member in ensuring the smooth adaptation and change of the program in response to changes in industry's needs.

Professional associations would also appear to have a potential role in the life of both the student and the graduate, though at the time of the survey few of the graduates were involved with such associations. Such associations, if effective in involving graduates, might be a useful means of maintaining a liaison between the graduates and the Gas Technology program. They could function as spokesmen for the needs of graduates, and in doing so provide institutions such as NAIT with information about upgrading courses or programs that might be needed. One way the associations might gain the influence they apparently now lack would be for more stress to be placed on the role of such organizations during the time the students are at NAIT.

Chapter 7

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A summary of the purposes and findings of this study are given in this chapter together with conclusions, recommendations, and suggestions for further research.

SUMMARY

This study was undertaken to provide a description of the graduates from 1965 through 1971 of the Gas Technology program at NAIT, touching upon personal data, their reasons for entering the program, their perceptions of the program, their subsequent employment experiences, and their evaluation of the contribution made by the Gas Technology program in preparing them for their present employment. These purposes were translated into a series of questions which are returned to later in the chapter. A related study was conducted concurrently to obtain a similiar assessment of the value of the Gas Technology program from the supervisors of the graduates and to compare their assessments with those of the graduates (Ottley, 1973).

There were a number of ways in which the combined study was significant. In the first place, the study was done by a team (Ramer, Ottley) which worked out the overall design and gathered the data. In the second place, the mail-out questionnaire used for gathering the data was so designed that identical questions could be asked of both the graduates and their supervisors. This allowed for a direct comparison to be made of the views of graduates and supervisors. In the third place, the joint study provides a description of the views of the graduates as well as an example of a type of research which might be used in other programs and by other institutions. Finally, this study provides a description of the graduates of the Gas Technology program, including personal data, reasons for entering the program, perceptions of the program, employment experiences, and their level of satisfaction with the training they had received at NAIT.

In chapter 2 a review of the literature on follow-up studies was undertaken. The need for follow-up studies of technical-vocational graduates was revealed. Literature delineating the problems and advantages of mail questionnaires was also examined, providing guidance for the design of the follow-up procedures used in the joint study.

A brief report on the follow-up studies conducted at NAIT was provided in chapter 3. Six of the eight studies reported there were done in the Engineering Sciences Department. The other two studies were carried out in the Electronics Department and in the Business Administration Department.

The research design and procedures followed in the joint study was described in detail in Chapter 4. In addition to the guidelines from the literature, help was obtained in the design of the combined study from interviews conducted with persons who had conducted similiar research at NAIT and the University of Alberta.

The basis for the research for the combined study was the entire populations of the 1965 through 1971 graduates of the Gas Technology program together with all their supervisors. Return rates on the mailed out questionnaires were: graduates 76 percent; supervisors 85 percent.

An analysis of the data from the graduate questionnaires was presented in chapter 5. This consisted of a breakdown of the frequency and percentage distribution of the responses of the graduates to the questions found in the graduate questionnaire (Appendix B). Written comments by the graduates were integrated into the discussion of responses, where such comments added information or aided interpretation. For the convenience of the reader a brief summary of the findings is presented here.

Summary of Responses to Graduate Questionnaire

The graduating classes of the Gas Technology programs from 1965 through 1971 were all male, with their average age at graduation being 21.32 years. A total of 70.7 percent were married at the time of the survey.

Prior to enrolling in the Gas Technology program, over 52 percent indicated they had been out of school less than one year, while 55 percent had been in some other school program, with 48.1 percent indicating they had been in high school.

Over 43 percent indicated they thought no one in particular could be credited as the chief influence in their decision to enrol in the Gas Technology program.

Additional training had been taken, or was being taken, by over 79 percent of the graduates, with employer sponsored training the most common (52.4 percent).

Engineering degrees had either been earned or were being pursued by a total of 28 percent of the 1965 through 1968 graduates.

Of the 77 percent who indicated they planned to take additional training, the largest group (36.6 percent) planned to upgrade their steam engineering qualifications.

Canada Manpower was cited as most helpful in obtaining their first job after graduation by 53.2 percent of the graduates; with later graduates more often citing it than did earlier ones.

Job mobility was quite low with a majority of respondents (68.3 percent) still working at the same job they had first taken after graduation, and none having held more than three jobs during that time. However, fully 77 percent indicated they had received one or more promotions, though only 14.6 percent indicated they held supervisory positions. The average income of graduates was 753.48 dollars per month, with the 1965 graduates having the highest ($850.00), and the 1971 graduates reporting the lowest ($710.71).

Over half (57 percent) of the graduates indicated they spent some of their time working in the areas of Engineering

Technology and Gas Plant Operation, while 43 percent indicated they spent some of their working time in Field Operations. Other work categories had fewer than 25 percent indicating they spent work time in them.

A large majority (89.8 percent) of the respondents indicated they were either moderately or totally satisfied with their present work. Where any dissatisfactions were expressed, they seemed to stem from either feelings of under-utilization, or from a perceived lack of promotional opportunities. In spite of some expressed dissatisfactions, over 70 percent of the respondents indicated they planned to stay in the same field, suggesting a generally high level of occupational satisfaction.

Membership in professional organizations or trade unions proved relatively unpopular judged from the fact that less than one-third (30.5 percent) held membership in such organizations.

Summary of Graduate Responses to Part of Questionnaire Submitted to Graduates and Supervisors

Graduate respondents most frequently indicated that the best way to maintain their professional competence was through university or technical institute courses with 48.6 percent indicating this view.

When compared with employees having no technical training, but the same amount of work experience, 76.6 percent of the graduate respondents thought graduates were better prepared for their first jobs; 44.8 percent thought graduates received better first jobs; 60.5 percent thought graduates needed less training on the job; and 57.1 percent thought graduates had better promotional records.

Gas plant operations was considered the best employment area for graduates by 56.9 percent of the respondents, while engineering technology was chosen as best by 27.8 percent, and field operations by 11.1 percent.

The respondents evaluated the NAIT curriculum in terms of its usefulness in preparing graduates for specific job areas, the usefulness of particular subject areas in the curriculum, and the type of emphasis the program should be given. The training was judged useful for engineering technology by 89.8 percent, for gas plant operations by 87.2 percent, for field operations by 70.5 percent, for laboratory work by 60.2 percent, for transmission work by 59.2 percent, and for construction work by 44.8 percent.

The curriculum areas and the percentage of respondents who ranked each useful were: Gas Processing - 92.0 percent, Instrumentation (including Electronics) - 90.8 percent, English - 85.8 percent, Chemistry - 85.7 percent, Mathematics - 84.4 percent, Gas Transmission - 69.4 percent, and Fortran - 35.5 percent.

The majority of respondents (53.9 percent) indicated that the Gas Technology program should place the greatest emphasis on the development of an ability for self-education and adaptability. The fewest (20.5 percent) thought the development of specific skills should be the focal point of the program.

A total of 75 percent of the respondents indicated they would recommend the Gas Technology program at NAIT to someone planning a career in the natural gas industry, indicating a broad base of support for the program among its graduates.

A discussion of some of the findings presented in chapter 5 and summarized in this chapter was presented in chapter 6.

INFERENCES AND CONCLUSIONS

A number of inferences and conclusions were drawn from the study and are presented here as answers to the questions raised on page 6. As a convenience to the reader the questions are repeated here.

1. What were the characteristics of students entering the program?

The program had attracted only male students with an average age of just over 19 years. About half of the students entered the program directly out of high school, and nearly all of them had limited work experience.

2. Who was most influential in their decision to enrol in the Gas Technology program?

There did not appear to be any one agency or class of person most responsible for influencing potential students in their choice of the Gas Technology program. This suggests that distribution of information to potential students should be done through all available channels rather than being focused on any one group.

3. Did the graduates perceive training for immediate employment as being more valuable than training in basic principles?

The graduates perceived training in basic skills as being more valuable because of the need for adaptability. However, they did recognize the need for saleable skills and included a number of program suggestions designed to ensure this. These included such things as tours in the first year of the program, laboratory experience, and summer work experience.

4. What were the graduates' perceptions of their preparedness for employment?

Graduates generally viewed themselves as better qualified for their first jobs than other new employees having equal experience but lacking their technical training. This resulted in them getting better first jobs, needing less on the job training, and having better promotional opportunities in their jobs than other new employees lacking their technical training.

5. What curriculum subjects were judged most relevent to success on the job?

The curriculum areas judged useful to success on the job by over 50 percent of the graduates, ranked from highest to lowest, were: Gas Processing, Instrumentation (including Electronics), English, Chemistry, Mathematics, Gas Transmission, Power Plant Engineering, and Physics.

6. How relevant was the training for the jobs the graduates were required to perform?

The employment areas for which the Gas Technology program provided the most useful training were engineering technology, gas plant operation, field operations, laboratory work, and gas transmission, respectively.

7. What were the graduates' overall assessments of their program?

The overall view of the program held by the graduates was favorable, as evidenced by the fact that three-quarters of the respondents said they would recommend the Gas Technology program to someone planning a career in the natural gas industry.

8. How did graduates obtain their first job placement upon graduation?

The acceptance by the graduates of Canada Manpower as a prime contact for the obtainment of their first job seemed to have been a major development during the period from 1965 through 1971, with 64.4 percent of the 1968 through 1971 graduates crediting Canada Manpower with helping them find their first job, while only 20 percent of the 1965 through 1967 graduates gave such credit.

9. How did the graduates' promotional records compare with other employees having similiar jobs and equal experience, but lacking equivalent formal training?

Over half (57.1 percent) of the graduates thought their promotional records were better or much better than other employees lacking their technical training.

10. What patterns of advancement and remuneration were experienced by graduates?

A small percentage (15 to 25 percent) of graduates became supervisors within seven or eight years of graduating, though almost all had received jobs involving increased responsibility after gaining work experience. Associated with the increased responsibility was increased pay. No specific complaints were made about level of pay in spite of the fact that the average monthly income of 1965 graduates was only 19.7 percent higher than that of the 1971 graduates.

11. What area of the natural gas industry provided the best employment opportunities for graduates?

Graduates viewed gas plant operations as the type of work which provided them with the best opportunities for advancement.

12. To what extent did graduates affiliate with trade and professional organizations?

The graduates seemed to show a relatively low level of interest in membership in professional associations and unions, with less than one-third holding memberships in such organizations.

13. What did graduates perceive as the best way to keep up-to-date with their technology?

Almost half (48.6 percent) of the graduates viewed enrollment in programs offered at universities and technical institutes as being the best way of maintaining their professional competence while company sponsored training was selected by 37.8 percent.

14. What post-graduation educational activities were the graduates involved in?

Most graduates took some form of on-the-job and job related training during the early part of their work careers. After working three or four years, as high as 28 percent had enrolled in courses leading to an engineering degree. As many as 35 percent had upgraded their steam engineering qualifications.

15. What were the attitudes of graduates toward their existing employment?

Graduates were generally quite well satisfied with their jobs. Dissatisfactions that were expressed seemed to arise out of either under-utilization on the job or from a perceived lack of promotional opportunities resulting in part from promotional channels being blocked by engineers. (This may explain why over 25 percent of those graduates with more than four years work experience had either completed or were working on degrees in engineering.)

16. What were the graduates' plans for their career futures?

The majority (70.9 percent) of the graduates intended to stay in the same field of employment that they were in at the time of the survey.

17. What were the strengths and weaknesses of the methodology used in this study?

The methodology used in this study seemed to work well, but the success depended on certain critical factors which would need to be duplicated if the methodology were to be used in other studies. Included are the following: (1) complete co-operation of the administration and staff of the section producing the graduates; (2) complete co-operation of the higher levels of administration in the institute involved; (3) complete co-operation of the industries employing the graduates; and (4) the ability to locate the addresses of the graduates.

RECOMMENDATIONS

The team approach taken in gathering data for the combined study together with the problems identified in follow-up studies that had been done at NAIT (ch. 3) suggests the desirability of having a team of instructors, assisted by a person or persons expert in research, conducting such research. The expert might be retained as a staff member at NAIT available to aid such teams of instructors in various sections of the Institute. There would be several advantages to such an approach.

The team approach allows more people to be involved in the research thus reducing somewhat the work load of each. A team also has the advantage of pooling ideas that might not be available to an individual. If such a team worked with a staff specialist there would be the advantages of expertise combined with the advantages of instructor involvement in research designed to provide information useful in curriculum revision. Instructor involvement should also act as a motivator to the instructors to be involved in curriculum change, and should thus help overcome any instructor resistance to change.

An added advantage would be the fact that contacts with former students would be made by people known to the graduates. In most situations this should increase the support of graduates for the program and should also help to increase the rate of return where mail-questionnaires are used.

A third advantage of the approach suggested is that having an expert involved in follow-up studies conducted by NAIT staff should result in improvement in the quality of questionnaires and procedures used. It should also result in an improvement being realized in the system of keeping addresses of former students up-to-date.

Instructors in the Gas Technology section should be made aware of the findings of this research and should consider the merits of the questions raised and the proposals made with respect to recruitment of students (p. 105), orientation of students (p. 106), program emphasis (p. 106), program evaluation (p. 108), role of Canada Manpower (p. 109), job mobility (p. 110), membership in professional associations (p. 111), upgrading of qualifications (p. 112), and attitudes toward the job (p. 113).

A few of the highlights are outlined here.

1. In the area of recruitment, there was no clearly defined group who were identified as most influential in the graduates original choice of the Gas Technology program. This suggests that advertising of the program might need to be handled through all possible agencies.

2. Graduate comments and the lack of work experience at the time they entered the program both suggested the importance of an orientation program for entering students stressing the career opportunities and problems.

3. Graduates thought the program should provide basic training applicable to many situations as well as training in specific job skills.

4. Graduates thought the program had done a good job of preparing them for their jobs. The courses included in the program were all rated useful for job success by over half of the graduates with the exception of Fortran. The reasons for nonacceptance of this course should be analyzed.

5. Canada Manpower's increasingly active role should be explored to see if close association with them is producing the desired results for the Gas Technology section.

6. The job mobility rates were found to be fairly low. This should be examined more closely to see if there are program implications in this finding.

7. Instructors should explore the reasons for low membership in professional associations. Do such associations have a potentially more useful role that they could play in program development?

8. The positive view held by graduates of training offered by institutions such as NAIT requires an examination the potential demand from graduates for courses that NAIT might offer that would permit them to upgrade their qualifications.

9. Though most graduates appeared to be reasonably satisfied, there were enough expressions of dissatisfaction to warrant a closer look to see if the dissatisfactions are inevitable or if some of the dissatisfactions could be reduced by changes in the program.

RECOMMENDATIONS FOR FURTHER RESEARCH

A number of research recommendations arising out of this study are presented here.

1. Recommendation is made that follow-up studies be done of the graduates of other sections at NAIT using an instrument and procedures like those used in this study, in order to further test the methodology used. One such study might be done in a well-defined industry as was the case in this study; another study might be conducted in an area where the industry is poorly defined. An example of the first might be the Food Technology, the second the Administrative Management section.

2. A longitudinal study might be done to establish percentage trends for those who go to university to further their education after graduation from a program at NAIT. In Gas Technology this might confirm or repudiate the finding that over 25 percent go to university to obtain degrees after working a few years. Similiar studies done in other technologies might also check out this tendency, to see if it applies there.

3. Among the subjects taken by the Gas Technology students at NAIT, English was ranked third in importance, after Gas

Processing and Instrumentation. Research should be done to see if this view is generally held by students in technology programs, with the possibility in mind of giving English instruction greater emphasis.

4. This study found that 53.9 percent of the respondents thought the Gas Technology program should place the greatest emphasis on the development of an ability for self-education and adaptability, while 20.5 percent thought the development of specific skills should be the focal point of the program. Research should be done to see if there are clearly discernible characteristics associated with these two response patterns. If such differences are found, implications for programming may arise.

5. Canada Manpower was cited as most helpful in obtaining their first job by over 50 percent of the Gas Technology graduates. Research should be done to see what role Canada Manpower plays in the placement of graduates from other technologies and in the less technical areas, such as Marketing and Administrative Management.

6. Research should be done into the role played by professional associations open to Gas Technology graduates. Such research might help explain why these associations attracted so few graduates to membership.

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APPENDIX A

INITIAL AND REMINDER LETTERS TO EMPLOYING COMPANIES

815A General Services Bldg.
March 1, 1972
Telephone 432-4908

Dear

During the last seven years a number of changes have been made in the NAIT Gas Technology Program. These changes have been made in an attempt to improve the quality of the employee you obtain when you hire a Gas Technology Graduate. In order to ascertain the effectiveness of these program changes and to identify changes that should still be made we are seeking your co-operation in a follow-up study of our graduates. The objectives of this study will be to determine the post-graduation activities of the Gas Technology Graduates and to assess the success they have achieved in their chosen field, and to secure an evaluation of the training provided at NAIT from both graduates and their immediate supervisors.

At a meeting of the Gas Technology Advisory Committee on the twenty-second of February (1972) the members present wholeheartedly supported the study and advised that an evaluation of the training provided at NAIT should also be sought from supervisors two or three levels above the graduates. Several of the members present agreed to forward the names and addresses of first and second line supervisors and the names of Gas Technology graduates in the employ of their companies.

Your co-operation in providing us with the names and addresses of the immediate supervisors, the names and addresses of the second or third level supervisors, and the names of Gas Technology graduates employed with your company will be very much appreciated. This information will make it possible for us to seek information about your company's experiences with our graduates comparable to what we are getting from other companies.

The information from this study will be used in the preparation of Masters' theses in Educational Administration and you can be assured that all information provided will be kept in strictest confidence.

Thanking you for your co-operation,

Sincerely yours,

H. Ottley, P. Eng.
J. R. Ramer

March 22, 1972

Dear Sir:

In a letter dated March 1, 1972 I outlined a proposal for conducting a follow-up study on Gas Technology graduates of NAIT and their supervisors, and requested the co-operation of your company in providing the names of any Gas Technology graduates that you employ as well as the names of their immediate supervisors. Up to the present no reply has been received.

If you have not had time to attend to this matter we would still appreciate a response from you; if you have already mailed us the information we would like to take this opportunity to thank you for your co-operation.

Sincerely,

H. Ottley, P. Eng. and J. R. Ramer
(Staff Members at NAIT)

APPENDIX B

THE QUESTIONNAIRE, COVERING LETTERS, REMINDER CARD, AND CARD OF THANKS

March 15, 1972

Dear Graduate:

We are attempting to evaluate the success of the NAIT Gas Technology Program, and as a graduate you are the person who can best judge its success. We propose to do this evaluation by asking both graduates and supervisors their views. The responses will be used in the preparation of Masters' theses, and as a guide for future program revisions. Please let us know your opinion about the Gas Technology Program by filling in the attached questionnaire.

This questionnaire is identified by a number so that follow-up letters can be sent to those who do not respond to the initial request. Individual responses will be treated with the strictest confidence.

To help you answer quickly, answers to the majority of questions require only a check mark ( ) beside your choice. Where space for additional comments is provided we will be very interested in any comments you might care to make.

Please return the completed questionnaire in the enclosed, stamped, self-addressed envelope. Receipt of the completed questionnaire by March 31, 1972, will be greatly appreciated.

Thank you for your time and co-operation in this matter.

Yours very truly,

H. Ottley, P. Eng.
J. R. Ramer
(Staff members — NAIT)

GAS TECHNOLOGY GRADUATE QUESTIONNAIRE

(Note: Numbers in the right hand margin are for statistical purposes only. If spaces provided for comments are too small, please add comments on the backs of the pages.)

CC

1. What is your present home address? ______________________________

____

____

2. What is your present marital status? Please check (✓) one. 1

a. Single......................( )
b. Married.....................( )
c. Divorced....................( )
d. Separated..............( )
e. Widowed................( )

3. How many full years were you out of school before enrolling in the Gas Technology program? Check (✓) one. 2

a. None........................( )
b. One year....................( )
c. Two years...................( )
d. Three years............( )
e. Four years.............( )
f. Five or more years.....( )

4. What were you doing before coming to NAIT? Check (✓) item(s) below. 3

a. Attended Institute of Technology..............................( )
b. Attended Business College.....................................( )
c. Attended High School..( )
d. Attended Community or Junior College..........................( )
e. Attended University...( )
f. Worked in Gas Technology Area.................................( )
g. Worked in Other Fields..( )
h. Other, specify ______________________________( )

5. What was the chief reason that influenced you to enroll in the Gas Technology program? Please check (✓) one. 4

Advice from:
a. Your family...( )
b. High School Counsellor..( )
c. Former students or graduates of Gas Technology................( )
d. Those working in Gas Technology Field.........................( )
e. No-one in particular..( )
f. Other, please specify ______________________________( )

6. If you have taken any additional courses or training since graduating from NAIT, please check (✓) appropriate item(s) below.

a. Employer sponsored training...................................( ) 5
b. Apprenticeship training.......................................( ) 6
c. Studies leading to Senior Technologist status.................( ) 7
d. Studies leading to Professional Engineering Qualifications...( ) 8
e. Upgrading Steam Engineering Qualifications....................( ) 9

6. Additional courses or training (continued)

	Full time	Part time	CC
			10
f. Community or Junior College	( )	( )	11
g. Technical Institute	( )	( )	12
h. University	( )	( )	13
i. Other, please specify			14
	________________________	( )	15
			16

7. a. Please indicate, degrees, diplomas, certificates sought

____ 17

____ 18

b. Please indicate degrees, diplomas, certificates earned

____ 19

20

8. What are your plans for further education? Please check (✓) the appropriate item(s) below.

a. At present no plans..( ) 21
b. Employer sponsored training..................................( ) 22
c. Upgrading Steam Engineering Qualifications..................( ) 23
d. Apprenticeship training......................................( ) 24
Branch Preferred ________________________

e. Studies leading to Senior Technologist status...............( ) 25
Branch Preferred ________________________

f. Studies leading to Professional Engineering status..........( ) 26
Branch Preferred ________________________

g. Community or Junior College..................................( ) 27
Program Preferred ________________________

h. Technical Institute..( ) 28
Program Preferred ________________________

i. University...( ) 29
Program Preferred ________________________

j. Other, please specify
________________________( ) 30

9. Which of the fo[illegible]ng do you regard as having been the most helpful in obtai[illegible]ng your first job after graduating from the Gas Technology program? Please check (✓) one. 31

a. Direct contact with employer...( ) d. Advertisements.........( )
b. Canada Manpower at NAIT........( ) e. Friends or relatives...( )
c. Your instructor................( ) f. Other, specify

________________________( )

CC

9. Help in obtaining first job (continued)

Any comments you would care to make on what help you received in obtaining your first job after graduating from the Gas Technology program would be appreciated.

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10. Was your first job after graduation from the Gas Technology program at NAIT a continuation of a summer or part time job held while you were a student at NAIT? Please check (✓). 32

a. Yes............( )   b. No................( )

11. How many full time jobs have you held since graduation from NAIT? If employed, include your present job. Please check (✓) one. 33

a. None......................( )
b. One.......................( )
c. Two.......................( )
d. Three.....................( )
e. Four......................( )
f. Five or more.............( )

12. Please provide the following information about your present job.

a. Name and address of company. Name ____________________

Address ____________________

____

b. Name of your supervisor____________________

c. Your position with company____________________ 34

d. Number of people you supervise____________________ 35

e. Your present monthly salary before deductions. Please check (✓) appropriate salary range. 36

(1) Less than $500.........( )
(2) $501 to $550...........( )
(3) $551 to $600...........( )
(4) $601 to $650...........( )
(5) $651 to $700...........( )
(6) $701 to $750.............( )
(7) $751 to $800.............( )
(8) $801 to $850.............( )
(9) $851 to $900.............( )
(10) More than $900..........( )

13. With reference to your present job show the approximate percentage of time spent working in the following employment areas.

a. Engineering technology (facilities, design, routine calculations, gas plant valuation, reports)..............(%) 37,38
b. Gas plant operation (plant operator, plant maintenance, plant start-up)......................................(%) 39,40
c. Field operations (wells and systems operator, well testing, wells and systems maintenance..........................(%) 41,42
d. Laboratory...(%) 43,44
e. Construction...(%) 45,46
f. Transmission...(%) 47,48
g. Other, please specify

____________________......(%) 49,50

Total (100%)

4 CC

14. How well satisfied are you with your present work? Please check (✓).
a. Satisfied.................( ) c. Indifferent...............( ) 51
b. Moderately satisfied.......( ) d. Dissatisfied..............( )

Any comment you would care to make on your choice of response would be appreciated.

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15. If your present job is other than your first job after graduation show the approximate percentage of time spent working in the following employment areas for your first job.
a. Engineering technology (facilities, design, routine calculations, gas plant valuation, reports).............(%) 52,53
b. Gas plant operation (plant operator, plant maintenance, plant start-up).......................................(%) 54,55
c. Field operations (wells and systems operator, well testing, wells and systems maintenance).................(%) 56,57
d. Laboratory...(%) 58,59
e. Construction.......................................(%) 60,61
f. Transmission.......................................(%) 62,63
g. Other, please specify
______________________________ (%) 64,65
Total (100%)

16. How many promotions have you had since graduation from the Gas Technology program at NAit? (Consider promotions as increases in level of responsibility, either in one company or between companies. Do not include regular salary increases as promotions.) Check (✓) one. 66
a. None.......................( ) d. Three...................( )
b. One........................( ) e. Four....................( )
c. Two........................( )

17. What are your plans for your occupational future? Check (✓) one. 67
a. To remain in present occupational field and advance in it....( )
b. To shift to a different occupational field..................( )
c. Other, please specify.

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18. Are you a member of a professional organization or trade union? If you are please check (✓) the appropriate space(s) below.
a. The Alberta Society of Engineering Technologists............( ) 68
b. Trade Union...( ) 69
c. Association of Professional Engineers.......................( ) 70
d. Other, please specify 71
72
____ 73 77
74 78
____ 75 79
76 80

19. In your opinion how best could a Gas Technology graduate employed by your company maintain a level of training that would best serve both himself and the company? Check (✓) the response you consider best. 10

a. Part time extension courses at a formal institution such as the University, NAIT or SAIT............................( )
b. Company sponsored training programs..........................( )
c. Self study through trade or professional journals and other literature..( )
d. No study necessary--he will benefit most if he keeps his eyes and ears open on the job..............................( )
e. Other, please specify

____

____( )

20. Referring to their preparedness to handle their first job after graduation, how do Gas Technology graduates compare with the other new employees having equal experience but no formal technical training? Check (✓) one. 11

Graduates are:
a. better prepared...( )
b. about as well prepared......................................( )
c. less prepared...( )

Any comments on the strengths or weaknesses that you have observed in the Gas Technology graduates' training would be appreciated.

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21. How do the beginning jobs of the Gas Technology graduates compare with the beginning jobs of the other new employees having equal experience but no formal technical training? Check (✓) one. 12

Graduates get:
a. Better jobs................( )
b. Poorer jobs................( )
c. Similar jobs...............( )
d. Don't know..............( )
e. Undecided...............( )
f. Other, specify..........( )

____

22. Referring to jobs directly related to their NAIT training, how much on-the-job training do Gas Technology graduates need in their first job compared with other employees having equal experience but no formal technical training? Check (✓) one. 13

Graduates need:
a. Much more..................( )
b. More.......................( )
c. As much as.................( )
d. Less....................( )
e. Much less...............( )

23. On-the-job training needed by Gas Technology graduates (continued) CC

Any comments you would care to make on your choice of response to this question would be appreciated.

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24. How does the promotional record of Gas Technology graduates compare with that of other employees occupying similar positions but having no formal technical training? Check (✓) one. 14

a. Much better..................( ) d. Poorer...................( )
b. Better.......................( ) e. Much poorer..............( )
c. As good as...................( )

Any comment you would care to make on your choice is appreciated.

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25. Which of the following employment areas offer the NAIT Gas Technology graduate the best opportunity for advancement in your company? Check (✓) one. 15

a. Engineering technology (facilities, design, routine calculations, gas plant valuation, reports)...........................( )
b. Gas plant operation (plant operator, plant maintenance, plant start-up)...( )
c. Field operations (wells and systems operator, well testing, wells and systems maintenance).............................( )
d. Laboratory..( )
e. Construction..( )
f. Transmission..( )
g. Other, please specify
___________________________________( )

Any comment you would care to make on your choice would be appreciated.

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26. Rate NAIT Gas Technology training as to its usefulness in preparing the graduate for each of the following areas of work. Please check (✓) one for each area.

	Very Useful	Useful	Of Little Use	Useless	Don't Know	CC
a. Engineering technology	( )	( )	( )	( )	( )	16
b. Gas plant operation	( )	( )	( )	( )	( )	17
c. Field operations	( )	( )	( )	( )	( )	18
d. Laboratory	( )	( )	( )	( )	( )	19
e. Construction	( )	( )	( )	( )	( )	20
f. Transmission	( )	( )	( )	( )	( )	21
g. Other, specify ____________________	( )	( )	( )	( )	( )	22

Any comments you would care to make about your choices would be appreciated.

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27. Rate each of the following curriculum areas as to its usefulness to a Gas Technology graduate's success on the job that you supervise. Please check (✓) one response for each subject area.

	Very Useful	Useful	Of Little Use	Useless	Don't Know	
a. English	( )	( )	( )	( )	( )	26
b. Mathematics	( )	( )	( )	( )	( )	27
c. Fortran	( )	( )	( )	( )	( )	28
d. Physics, including Electricity	( )	( )	( )	( )	( )	29
e. Chemistry	( )	( )	( )	( )	( )	30
f. Instrumentation, including Electronics	( )	( )	( )	( )	( )	31
g. Gas Processing	( )	( )	( )	( )	( )	32
h. Gas Transmission	( )	( )	( )	( )	( )	33
i. Power Plant Engineering	( )	( )	( )	( )	( )	34
j. Other, specify ____________________	( )	( )	( )	( )	( )	35

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Any additional comments you would care to make would be appreciated.

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CC

28. The statements below refer to the emphasis that should be given in NAIT's curriculum for Gas Technology. Please rank these statements in order of importance, i.e. most important as one (1) and the least important as three (3).

Training should emphasize:

a. Skills so that the graduate needs a minimum of on-the-job training in his first job....................................( ) 37

b. Basic principles only (Mathematics, Physics, Theory of Recovery, Processing and Design, etc.).........................( ) 38

c. The development of an ability for self-education and adaptability...( ) 39

Any other comments you would care to make would be greatly appreciated.

____

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29. Would you recommend the Gas Technology program at NAIT to someone planning a career in the natural gas industry? Please check (√) one. 40

a. Yes...( )
b. No..( )
c. Undecided...( )

30. In your view, what could be done to improve the Gas Technology program at NAIT?

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THANK YOU FOR YOUR COOPERATION

_______________, 1972

Dear

Further to our telephone conversation regarding my proposed follow-up study of the Gas Technology graduates, I am sending to you for completion a questionnaire designed to determine the opinions of the supervisors.

A stamped, self-addressed envelope is included for your convenience, and return of the questionnaire by March 31st would be appreciated.

If your have any questions I can be reached at 432-4908 or 469-8146.

Thanking you for your co-operation.

Yours very truly,

Horace Ottley, P. Eng.

______________, 1972

Dear

At the Gas Technology Advisory Committee meeting of February 22, 1972, we outlined a proposal for doing a follow-up study of Gas Technology graduates, and the members present endorsed the proposal.

The initial plan was to secure an evaluation of the training provided in the Gas Technology program by sending questionnaires to the graduates and their immediate supervisors, but members of the Advisory Committee recommended that additional opinions be obtained from supervisors two or three levels above the graduate, since these may differ from the opinions of the immediate supervisors. In compliance with this recommendation we are asking that you complete and return the attached questionnaire.

Return by March 31st will be greatly appreciated. Please be assured that the source of individual replies will be treated as confidential.

Thanking you for your co-operation.

Yours very truly,

H. E. R. Ottley and J. R. Ramer

March 15, 1972

Dear Supervisor:

In early March we approached your company asking its co-operation in a follow-up study that we planned to conduct on the graduates of our Gas Technology program at NAIT, and received a favorable reply. The purposes of the study are: (1) to determine the post-graduation activities of the Gas Technology graduates, and assess the success achieved in their chosen career; and (2) to secure an evaluation of the training provided at NAIT from both graduates and their supervisors. As staff members at NAIT, one of our concerns is to provide the best possible training for our students, and you can help us in our efforts to achieve this goal.

Your co-operation in completing and returning the attached questionnaire would be greatly appreciated. The answers to the majority of questions require only a check ( ) mark against your choice, and in some cases space has been provided for additional comments.

The return of the completed questionnaire in the enclosed, stamped, self-addressed envelope by March 31st will be greatly appreciated. Be assured that your replies will be treated as confidential.

We wish to thank you for your co-operation in this matter.

Sincerely yours,

H. Ottley, P. Eng.
J. R. Ramer
(Staff members — NAIT)

EMPLOYER QUESTIONNAIRE

(Note: Numbers in the right hand margin are for statistical purposes only. If spaces provided are too small for comments, please write on the backs of the pages.)

1. Name: ______________________________ CC

   Mailing Address: ______________________________

   ____

   ____

   Position with Company: ______________________________ 1

   Number of Years in a Supervisory Capacity ______________________________ 2

2. The following statements apply to the opportunity that a supervisor has to advise on the type of training given to Gas Technology students at NAIT. Please check (✓) the statement that best reflects your situation. 3
   a. I see the NAIT instructors from time to time and pass on advice to them..( )
   b. I see the NAIT instructors from time to time but I never pass on advice to them..( )
   c. I have some ideas about training but I don't know who to contact with them..( )
   d. I have no contact with the NAIT instructors at all..........( )
   e. I pass suggestions on to my superiors for transmission to NAIT..( )
   f. I don't think that supervisors should be expected to give this type of advice..( )
   g. Other, please specify

   ____

   ______________________________( )

3. The statements below refer to company training programs. Please check (✓) the statements that come closest to describing training programs in your company. Check (✓) as many as apply.
   Training programs:
   a. are provided for all new employees..........................( ) 4
   b. are provided for new employees without formal technical training (as given at NAIT)..........................( ) 5
   c. are provided as preparation for promotion..................( ) 6
   d. are provided in preparation for transfer to jobs requiring new skills..........................( ) 7
   e. are not provided but employees serve an apprenticeship with an experienced employee..........................( ) 8
   f. Other, please specify ______________________________

   ______________________________( ) 9

CC

4. In your opinion how best could a Gas Technology graduate employed by your company maintain a level of training that would best serve both himself and the company? Check (✓) the response you consider best. 10

a. Part time extension courses at a formal institution such as the University, NAIT or SAIT.................................( )

b. Company sponsored training programs...........................( )

c. Self study through trade or professional journals and other literature...( )

d. No study necessary--he will benefit most if he keeps his eyes and ears open on the job.....................................( )

e. Other, please specify

____

____( )

5. Referring to their preparedness to handle their first job after graduation, how do Gas Technology graduates compare with the other new employees having equal experience but no formal technical training? Check (✓) one. 11

Graduates are:

a. better prepared...( )

b. about as well prepared.......................................( )

c. less prepared..( )

Any comments on the strengths or weaknesses that you have observed in the Gas Technology graduates' training would be appreciated.

____

____

____

6. How do the beginning jobs of the Gas Technology graduates compare with the beginning jobs of the other new employees having equal experience but no formal technical training? Check (✓) one. 12

Graduates get:

a. Better jobs................( )

b. Poorer jobs...............( )

c. Similar jobs...............( )

d. Don't know..............( )

e. Undecided................( )

f. Other, specify..........( )

____

7. Referring to jobs directly related to their NAIT training, how much on-the-job training do Gas Technology graduates need in their first job compared with other employees having equal experience but no formal technical training? Check (✓) one. 13

Graduates need:

a. Much more..................( )

b. More...........................( )

c. As much as..................( )

d. Less.............................( )

e. Much less....................( )

7. On-the-job training needed by Gas Technology graduates (continued) CC

Any comments you would care to make on your choice of response to this question would be appreciated.

____

____

8. How does the promotional record of Gas Technology graduates compare with that of other employees occupying similar positions but having no formal technical training? Check (✓) one. 14

a. Much better.................( )
b. Better.....................( )
c. As good as.................( )
d. Poorer...................( )
e. Much poorer..............( )

Any comment you would care to make on your choice is appreciated.

____

____

9. Which of the following employment areas offer the NAIT Gas Technology graduate the best opportunity for advancement in your company? Check (✓) one. 15

a. Engineering technology (facilities, design, routine calculations, gas plant valuation, reports).........................( )
b. Gas plant operation (plant operator, plant maintenance, plant start-up)..( )
c. Field operations (wells and systems operator, well testing, wells and systems maintenance)..............................( )
d. Laboratory...( )
e. Construction...( )
f. Transmission...( )
g. Other, please specify ____________________________________( )

Any comment you would care to make on your choice would be appreciated.

____

____

10. Rate NAIT Gas Technology training as to its usefulness in preparing the graduate for each of the following areas of work. Please check (✓) one for each area.

	Very Useful	Useful	Of Little Use	Useless	Don't Know	CC
a. Engineering technology	( )	( )	( )	( )	( )	16
b. Gas plant operation	( )	( )	( )	( )	( )	17
c. Field operations	( )	( )	( )	( )	( )	18
d. Laboratory	( )	( )	( )	( )	( )	19
e. Construction	( )	( )	( )	( )	( )	20
f. Transmission	( )	( )	( )	( )	( )	21
g. Other, specify ________________	( )	( )	( )	( )	( )	22

Any comments you would care to make about your choices would be appreciated.

____ 23

24

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11. Rate each of the following curriculum areas as to its usefulness to a Gas Technology graduate's success on the job that you supervise. Please check (✓) one response for each subject area.

	Very Useful	Useful	Of Little Use	Useless	Don't Know	
a. English	( )	( )	( )	( )	( )	26
b. Mathematics	( )	( )	( )	( )	( )	27
c. Fortran	( )	( )	( )	( )	( )	28
d. Physics, including Electricity	( )	( )	( )	( )	( )	29
e. Chemistry	( )	( )	( )	( )	( )	30
f. Instrumentation, including Electronics	( )	( )	( )	( )	( )	31
g. Gas Processing	( )	( )	( )	( )	( )	32
h. Gas Transmission	( )	( )	( )	( )	( )	33
i. Power Plant Engineering	( )	( )	( )	( )	( )	34
j. Other, specify ________________	( )	( )	( )	( )	( )	35

36

Any additional comments you would care to make would be appreciated.

____

____

CC

12. The statements below refer to the emphasis that should be given in NAIT's curriculum for Gas Technology. Please rank these statements in order of importance, i.e. most important as one (1) and the least important as three (3).
Training should emphasize:
   a. Skills so that the graduate needs a minimum of on-the-job training in his first job....................................( ) 37
   b. Basic principles only (Mathematics, Physics, Theory of Recovery, Processing and Design, etc.).......................( ) 38
   c. The development of an ability for self-education and adaptability...( ) 39

   Any other comments you would care to make would be greatly appreciated.

   ____

   ____

13. Would you recommend the Gas Technology program at NAIT to someone planning a career in the natural gas industry? Please check (✓) one. 40
   a. Yes...( )
   b. No..( )
   c. Undecided...( )

14. In your view, what could be done to improve the Gas Technology program at NAIT?

   ____ 74 75 76

   ____ 77 78 79 80

THANK YOU FOR YOUR COOPERATION

April 14, 1972

Dear Sir:

A few weeks ago we mailed a questionnaire to you regarding a follow-up study of the graduates of the Gas Technology program at NAIT, and no reply has been received to date. If you have not already returned this questionnaire we would appreciate your taking the time to do so. A second copy of the questionnaire is enclosed for your convenience.

Our request for your assistance in this study is based on the premise that an evaluation of the performance of the Gas Technology graduates can best be made by the graduates and the supervisors with whom they work. The opinions that you express will be most valuable in any assessment of the program offered at NAIT, and will help in keeping this program relevant to the needs of the graduates, and the industry in which they work.

Again we would like to assure you that all replies will be kept confidential, and to ak for your co-operation in completing and returning the questionnaire.

Sincerely,

H. Ottley & J. R. Ramer

POST CARD REMINDER

Approximately two weeks ago a questionnaire was mailed to you. If you have not returned your completed questionnaire would you please do so at your earliest convenience. If you have recently returned your questionnaire, our personal thanks for your co-operation.

It is important that we receive your completed questionnaire. Your opinions will help us more accurately assess the strengths and weaknesses of the NAIT Gas Technology program, and will thus help improve future programs.

Sincerely,

H. R. Ottley and J. R. Ramer

THANK YOU

This is just a note to thank you for your willing co-operation in our assessment of the NAIT Gas Technology Program. Your response has been most helpful to us in our study.

Sincerely,

H. Ottley and J. R. Ramer

APPENDIX C

OBJECTIVES OF THE GAS TECHNOLOGY SECTION

GENERAL OBJECTIVES OF THE
GAS TECHNOLOGY SECTION

1. To prepare the graduating technologist for gainful employment in the petroleum and natural gas industry or related industries such as gas transmission, equipment manufacturing, sales, and gas utilities.

2. To provide the graduate technologist with intermediate level technical skills so that he is suited for positions in operations and engineering offices. These skills should provide him with immediate horizontal mobility in industry.

3. To provide the graduate technologist with adequate mathematics and science background so that he will be able to grasp the principles of new technical developments and apply them in his work.